ON A COLLECTION OF OLIGOCHAETA FROM THE LESSER KNOWN PARTS OF INDIA AND FROM EASTERN PERSIA.

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(With Plates IX—XI.)

CONTENTS.

INTRODUCTION.

The following fairly extensive investigation is based on material from a number of sources :—

(i) By far the largest portion consists of a collection made by Dr. Baini Prashad in Central and Western India in June and July, 1917. These were the regions of India about whose earthworm fauna we knew least; and Dr. Prashad very kindly at my suggestion gave up a month of his vacation to making the collection. My best thanks are due to him for the expenditure of so much time, and for the large amount of labour involved in visiting so many different localities. The other collections are much smaller, and comprise—

(ii) One from Seistan and certain localities in the North-West Frontier Province and the Punjab, made by Dr. Annandale and Mr. S. W. Kemp in the course of their mollusc survey in Nov., 1918—Jan., 1919; this consists largely of fresh-water worms.

(iii) One from the Western Ghats, also of small fresh-water worms, by Dr. Annandale in March, 1918.

(iv) One from Rajputana in 1918, by the Agent to the Governor-General, Col. J. Manners-Smith.

(v) A number of tubes brought back by Dr. Baini Prashad from the Natural History Society of Bombay.

(vi) A small collection from the Garo Hills in Assam, by Mr. Kemp, in July-August, 1917.

(vii) One from the Darjiling District in the Eastern Himalayas, by Drs. Annandale and Gravely in October, 1917.

(viii) A few specimens from Shillong in Assam, collected by Dr. Annandale in April, 1918.

(ix) A few specimens sent at various times from Lucknow by Mr. G. S. Thapar.

The collections, including the types of new species, are now in the possession of the Indian Museum, with the exception of a few tubes which I am retaining for histological work in the future.

A considerable number of the species encountered are new, as was to be expected from the fact that the territory explored was mostly new or little worked. I have also met with a number of species previously described by other workers from single or ill-preserved specimens, and have sometimes been able to improve our knowledge of them. It can scarcely be said however that the results of the present investigation include anything of the first order of importance,—it is now too late to expect this. There are notable additions to the genera *Perionyx*, *Octochaetus*, and *Eudichogaster*. *Perionyx* must now be held to have a definite territory of its own in Western India, in addition to its head-quarters in the E. Himalayas; *Octochaetus* is to be recognized as an endemic and dominant genus in West and Central India; the limits of the *Eudichogaster* territory however remain where they were established by Michaelsen in 1909 (**3**). *Eudichogaster* is the characteristic earthworm of Central India. New species of *Perionyx* will still be brought from the Himalayas; new species of *Megascolex* from the South, and of *Eudichogaster* from Central India; but the main features of the Indian earthworm fauna are now fairly well defined.

Perionyx sansibaricus turns out to be one of the common earthworms of Western India, whence doubtless it was transferred to Zanzibar, where it was first found.

The new *Hoplochaetella* raises some interesting points of morphology and phylogeny, and helps to show,—what is illustrated by other parts of the paper also, and indeed, I suppose, by the experience of systematists in general,—that the smaller our material, the more precise and satisfactory is our systematic work. Here as elsewhere increase of knowledge brings sorrow and trouble, and where before we walked confidently as in the daylight, we hesitate and feel befogged.

I have previously had several opportunities,—more, perhaps, than have fallen to the lot of other workers,—of examining the curious gilled *Branchiura sowerbyi*, and have been interested in meeting it once again. this time from Lucknow. Though several workers (Beddard, Michaelsen, and myself) had previously sectioned the animal, the possibility of the protrusion of the ectal portion of the atrium as a relatively long penis was not suspected until recently. Several of the specimens from Lucknow had both penes protruded and visible on the surface.

A new *Megascolides* from the Western Ghats, and a previously imperfectly known *Glyphidrilus* now found at Lucknow, are interesting in view of the rarity of these genera in India. A *Drawida*, of a distinct variety, is one of the common worms of Bombay City and neighbourhood; the genus is otherwise almost confined to the South and to the E. Himalayas.

Fam. NAIDIDAE.

Genus **Chaetogaster.**

Chaetogaster bengalensis, Annand.

Five miles S.E. of Nasratabad, Seistan, E. Persia. Small pool in the desert; water fresh but turbid, bottom muddy with a fairly rich growth of *Potamogeton* and reeds, mostly in a dying condition. The specimens were on *Limnaea gedrosiana* var. *rectilabrum*, Annand. and Prashad, 26-xii-1918. N. Annandale and S. W. Kemp.

Peshawar, N.-W.F.P.; on *Limnaea acuminata*. 12-i-1919. N. Annandale. Several specimens.

Kalpani stream, near Nowshera, N.-W.F.P.; on *Limnaea acuminata*. 13-i-1919. N. Annandale. Four specimens.

Madhopur, Gurdaspur District, Punjab; on *Limnaea acuminata*. 27-i-1919. N. Annandale. Forty-nine specimens taken out of the mantle cavity of a single individual of *Limnaea*.

Satara Fort, W. Ghats; *ca.* 3,300 ft. 4-iii-1918. N. Annandale. On *Limnaea chlamys*, Benson.

The specimens from the Western Ghats and from Seistan were examined in some detail.

There is sometimes, in preserved specimens, a constriction between the pharyngeal region and the rest of the body. The length of the setae of segment ii is commonly 120μ, of the rest 60μ. In all the batches, 15 and 16 setae were quite commonly found in a single bundle.

The appearance of the "crop" is rather characteristic, owing to its complete investment of chloragogen cells. These have the arrangement of paving stones, lying side by side, and well demarcated from each other by linear intervals. The entrance to the crop is marked, as in the specimens from the Inlé Lake (**14**), by a ring of tall cells which project into the lumen.

The lateral commissural vessels in the oesophageal region are never swollen or heart-like. The dorsal vessel, on the other hand, is often dilated just behind the origin of these commissures.

The species appears to have a wide distribution, and to be the prevailing commensal of *Limnaea*. It thus takes the place in India of *C. limnaei*, which is found in a similar association in Europe; Michaelsen has however found *C. limnaei* on a specimen of *Limnaea* from the Kumaon District (Central Himalayas) (**3**). Last year I identified several specimens from a sponge (*Ephydatia fluviatilis*) from the Inlé Lake as doubtfully belonging to *C. limnaei* (**14**); through the kindness of Dr. Annandale I have recently had the advantage of comparing my examples of this form with a specimen of *C. limnaei* sent to the Indian Museum by Dr. J. H. Ashworth of Edinburgh; but I am still unable to say definitely that the Inlé worms either are or are not *C. limnaei*. The identification of these small worms from preserved material only is, as I have previously explained (**12**), often both difficult and extremely hazardous.

Chaetogaster spongillae, Annand.

Khandala, W. Ghats; from sponge (*Spongilla crateriformis*) in artificial tanks made by damming stream; bottom,—mud over rocks; some stones; weeds fairly abundant. 6-iii-1918 N. Annandale.

The length of a chain of two individuals was from ·47 to ·7 mm., the diameter ·15 mm. The head is relatively small in this species, and, as has previously been described, the upper lip projects forwards in front of the mouth, forming a short prostomium. There is a slight constriction between the pharyngeal region and the rest of the body. The number of setae in the first bundle was five or six, in those that follow four, and towards the hinder end three or fewer. I could not detect any difference in the thickness of the terminal prongs (in a previous description I have noted the distal prong as being the thinner); the length and other proportions are the same as those I formerly gave (**7**). Chloragogen cells are absent on the crop. $n = 8$, as before.

Chaetogaster punjabensis, Stephenson (?).

Nasratabad, Seistan, E. Persia; water-channel in Consulate Garden. Nov. and Dec. 1918. N. Annandale and S. W. Kemp.

A single specimen was found among a number of examples of *Nais communis* var. *punjabensis* in association with colonies of the Polyzoon *Lophopodella* (see below). The association was no doubt quite fortuitous.

Here again it is impossible to speak with certainty; the small size, and distinct and relatively long oesophagus of the specimen, are characteristics of *C. punjabensis*. The numbers of setae per bundle appear to be rather smaller here, and I could not follow the dorsal and ventral vessels forwards beyond the anterior end of the crop in a glycerine mount of the specimen; I also failed to distinguish any refractile body in the cerebral ganglion, though this is a notable feature, at least of living specimens.

The specimen was in a late stage of sexual maturity; the clitellum was present, and there was a mass of ova in the middle of the body; the animal was much swollen in this middle region. In the Punjab the Naid worms mostly become sexual at the beginning of the hot weather,—April and May; but this specimen was taken in Seistan in the early part of the cold weather.

Genus **Nais**.

Nais communis, Piguet var. **punjabensis**, Stephenson.

Nasratabad, Seistan; water-channel in Consulate Garden; water fresh but turbid, bottom muddy with a scanty growth of weeds. Nov. and Dec. 1918. N. Annandale and S. W. Kemp. Numerous specimens.

Open pool in the reed-beds of the Hamun-i-Helmand, a few miles east of Lab-i-Baring, Seistan. Water very slightly brackish, fairly clear, about five feet deep; bottom muddy with a luxuriant growth of *Potamogeton pectinatus*. 8-xii-1918. N. Annandale and S. W. Kemp. Three specimens.

Peshawar, N.-W.F.P.; on *Limnaea acuminata*. 12-i-1919. N. Annandale. A single specimen.

Khandalla, W. Ghats; in algae on cliff kept wet by spray of a small waterfall.[1] 7–9-iii-1918. N. Annandale. Two tubes, five specimens in one, four in the other.

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[1] N. Annandale, *Rec. Ind. Mus.* XVI, p. 121 (1919).

The specimen from Peshawar occurred along with *Chaetogaster bengalensis*; its presence in this association was probably accidental.

Dr. Annandale's note on the worms from Nasratabad runs:—"Oligochaetes in relatively long mucilaginous tubes intertwined with stems of weed. A colony of the Polyzoon *Lophopodella* attached to each tube." Of the two glass tubes in which the Nasratabad specimens were sent to me, one contained worms only, the other some fragments of weed, and several colonies of *Lophopodella*, each attached to a soft brownish tube. I found the worms on the fragments of weed, but there were none still remaining in the tubes to which the Polyzoon colonies adhered. I have found this worm in numbers in tubes in Lahore (**5**), but the tubes in this case were apparently those of insect larvae, not manufactured by the worms themselves.

The specimens from the Western Ghats are possibly a separate variety. The dorsal needles are in the var. *punjabensis* finely forked; though barely or not at all distinguishable with the ordinary high power, the forking is quite evident on examination with the oil immersion, when the needles lie in a favourable position. In these specimens I thought I detected a trace of bifurcation in a few cases on close observation, but in many the forking seemed quite definitely to be absent.

Nais paraguayensis, Mchlsn.

Plate IX, fig. 1.

Gwalior, Central India; in a pond, attached to *Hydrilla* and other débris; 18-vi-1917. B. Prashad. Three specimens.

This species has previously been recorded from Calcutta and from Sirsiah in Bihar by Michaelsen, and from Lahore by me. The species seems to be rather variable. The present specimens were from 4·5 to 7·5 mm. in length, and consisted of from 29 to 56 segments, without any sign of a budding zone. The ventral setae are three or four per bundle; in the body generally the prongs are equal in length, but the outer is only two-thirds or even half the thickness of the inner. In the first four seta-bearing segments both prongs seem to be longer and thinner than in more posterior segments, but the relative thicknesses are maintained; the outer prong is slightly longer than the inner; the shaft is also slightly thinner than in succeeding segments.

The dorsal bundles consist usually of one hair and one needle; two needles may occur, and also two hairs, in which case one is much shorter than the other. There are slight variations from the typical form among the needles; in one case the smaller outer prong was itself bifid; in another the longer prong was slightly bent outwards towards the smaller; in one specimen the outer prong was regularly very short (fig. 1, *a* and *b*).

var. **aequalis,** var. nov.

Plate IX, fig. 2.

Saugor, Central Provinces; in a large lake, attached to leaves. 20-vi-1917. B. Prashad. A single specimen, in spirit, and one preserved and flattened in glycerine on a slide at the time of capture.

The spirit specimen is 3·5 mm. in length, and ·23 mm. in thickness; it has 34 segments, with a short region posteriorly in which segments are not yet differentiated. There is no budding zone.

The prostomium is moderately large and long; its length is equal to its breadth at the base, and it is rounded anteriorly. There are no eyes. The anus is dorsal.

The dorsal setal bundles begin in segment vi. They consist of one hair and one needle seta,—never more than one of either. The hairs have approximately a length equal to the diameter of the body. The needles are slightly sickle-shaped (fig. 2), and forked distally; when the seta is in a good position for observation this can be seen with the ordinary high power. The prongs are of the same length (the outer may possibly be the least trifle longer), and join at an acute angle; the outer seems to be slightly thinner. In length these needles are 52μ, in thickness 2·5μ.

The ventral setae are of the usual type, and are usually 4 per bundle; 3 and 5 were also met with. In length they are 52μ, in thickness 2·5μ. The inner prong is of equal length with the outer, but is twice as thick. I cannot see any difference of type between the setae of segments ii—v and the rest; but unfortunately the one specimen is fixed in such a position that these setae can be seen well from neither side, and the other (the already mounted specimen) seems to be the just separated posterior animal of a chain, in which the anterior segments have not yet fully developed.

There is no stomach. Coelomic corpuscles are present. The cerebral ganglion is bifid both anteriorly and posteriorly, and consists of two more or less independent halves, contiguous for some distance along their inner borders.

In the typical form of *N. paraguayensis* the outer prong of the dorsal needles is considerably shorter than the inner, while in these specimens it is of equal length. As however there appear to be no other essential differences, it will, I think, be sufficient to describe them as a variety.

Nais pectinata, Stephenson.

Gwalior, Central India; in a pond, attached to *Hydrilla* and other débris. 18-vi-1917. B. Prashad. A single specimen.

The specimen agrees generally with those previously described from Bheemanagar, Travancore (**6**). Since the presence or absence of a stomachal dilatation is one of the few internal marks that are used as specific characters in this genus, I may supplement the original description by adding that there is none in this species.

Nais gwaliorensis, sp. nov.

Plate IX, figs. 3, 4.

Gwalior, Central India; in a pond, attached to *Hydrilla* and other débris. 18-vi-1917. B. Prashad. A single specimen.

The specimen is in length 2·7 mm., in thickness ·25 mm. There are 29 segments with a small zone behind where segments are not yet differentiated. There is no zone of budding. The prostomium is bluntly triangular, its length being equal to its base. Eyes are absent. There is also no stomachal dilatation on the alimentary canal.

The dorsal setae begin in segment vi, and each bundle consists usually of one hair and one needle seta; two hairs are sometimes found, in which case one is shorter and thinner than the other; once two hairs and two needles were seen,—the one couple may perhaps have been destined to replace the other when they fell out.

The hair is as a rule not quite equal in length to the diameter of the body. The needles are about 45μ in length (hardly any can be measured accurately, owing to their not lying flat), and bent at a very obtuse angle at a point rather distal to the middle (fig. 3). The distal section of the seta is slightly curved in the contrary direction,—very slightly only, so that the whole can hardly be described as sickle-shaped. There is an indefinite nodulus at the angle in the shaft; the length of the distal to that of the proximal section of the shaft is about as 2 to 3. The tip is bifid, the two prongs being visible to the ordinary high power of the microscope; the angle between the two prongs is moderately wide, and the outer, which continues the direction of the shaft, is slightly longer and perhaps slightly thinner than the inner.

The ventral bundles, in all segments from vi onwards, consist of four or five setae, 45—53μ in length and 2·5μ in thickness (fig. 4*a*). The nodulus is distal; its exact position on the shaft probably varies in the several setae of a bundle (*cf.* Stephenson, **10**), though I was not able to obtain exact measurements. The prongs are equal in length, the outer is not swollen at the base, and is only half or two-thirds as thick as the inner.

In the first four seta-bearing segments the form differs somewhat. The shafts of the setae are thinner and straighter; the nodulus is about the middle or a little proximal to the middle of the shaft; the outer prong is 1$\frac{1}{4}$ times as long as the inner, two-thirds as thick at the base, and more hooked (fig. 4*b*). There are four setae per bundle; their length is 50 to 56μ, and their thickness only 2μ.

Remarks:—The species to which the present comes nearest are *N. tenuidentis* (Walton, **15**) and *N. raviensis* (Stephenson, **9**). The distinguishing character of the former is the very long and slender prongs of the ventral setae,—hence its specific name. The separation of the present form from *N. raviensis* depends on the characters of the setae, both dorsal and ventral; the differences will be best realized by comparing the figures given in the present paper with text-fig. 1 of my description of *N. raviensis*. The most obvious are the position of the bend of the shaft of the dorsal needles (much nearer the middle here), the relative lengths of anterior and posterior ventral setae (the anterior are nearly twice as long as the posterior in *N. raviensis*), and the characters of the prongs of the anterior ventral setae (in *N. raviensis* the outer is very much the longer, and makes a very narrow angle with the inner).

Genus **Pristina**.

Pristina longiseta, Ehrbg.

Gwalior, Central India; in a pond, attached to *Hydrilla* and other débris. 18-vi-1917. B. Prashad. One complete specimen, and perhaps one or two more in which the characteristic proboscis or long setae were damaged.

The toothing of thehair setae was only just visible with the oil immersion lens.

Genus **Stylaria.**

Stylaria lacustris (L.).

Open pool in the reed-beds of the Hamun-i-Helmand, a few miles east of Lab-i-Baring, Seistan. Water very slightly brackish, fairly clear, about five feet deep; bottom muddy with a luxuriant growth of *Potamogeton pectinatus*. 8-xii-1918. N. Annandale and S. W. Kemp. Several specimens.

Fam. TUBIFICIDAE.

Genus **Branchiura.**

Branchiura sowerbyi, Bedd.

Lucknow, Gaumati River. 15-iii-1919. G. S. Thapar. A single specimen.

The specimen was of fair size, 50 mm. in length, and is interesting from the fact that both penes are protruded. As I have previously noted (**14**), a penis was not described or suspected to exist in this animal, until it was found in specimens from the Inlé Lake.

I have also received, taken on the same day and from the same source, a number of specimens of a species of *Branchiodrilus*, the Naid worm with gills remarkably like those of *Branchiura*, but on the anterior part of the body instead of the posterior. The occurrence of the two together is a point of some interest. I much regret not to be able to give the specific diagnosis of the *Branchiodrilus*, of which three species are known, all Indian; but the worms came to hand when the present paper was already completed, and I fear it will be some time before I have the opportunity of undertaking detailed investigations.

Fam. MONILIGASTRIDAE.

Genus **Drawida.**

Drawida barwelli (Bedd.) var. **impertusus,** var. nov.

Bombay, Victoria Gardens. 30-vi-1917. B. Prashad. Five specimens.

Bombay, under a tree near the Fort. 30-vi-1917. B. Prashad. Seven specimens.

Elephanta Island, Bombay; high up on a hill. 30-vi-1917. B. Prashad. Three specimens.

Elephanta Island, Bombay; in a rotten tree. 30-vi-1917. B. Prashad. A single specimen.

Elephanta Island, Bombay; on the sea-shore. 30-vi-1917. B. Prashad. A single specimen, immature.

External Characters :—The length of fair-sized specimens is from 45 to 48 mm., and their diameter 3·5 mm. The colour is a rather blotchy olive, darker on the dorsal surface than ventrally, with a still darker mid-dorsal line; the first few segments are pale. The number of segments in two specimens was 130 and 132.

The prostomium is small, prolobous, and under cover of the first segment.

Dorsal pores are absent.

The setae are small and closely paired, and are visible as far forward as the second segment. The interval *aa* is rather less than *bc* ($\frac{4}{5}$ or $\frac{5}{6}bc$), or may be fully equal to it towards the hinder end; *dd* is about $\frac{4}{7}$ of the circumference.

The nephridiopores are in a single line, just below the level of the setae *c*.

The clitellum extends over segments x-xiii (=4); it is not well defined, and the segments are largely unaltered.

The male pores are very prominent in furrow 10/11, and are situated midway between the lines of setae *b* and *c*. They are bordered by anterior and posterior lips, and it is these lips, rather than the apertures themselves, which are the conspicuous features; the extent of the lips is slightly variable,—from a point about in line with the ventral pair of setae nearly to the level of the lateral pair.

On segment x in front of the male apertures are a pair of whitish papillae with indefinite margins; the centre is whiter than the rest, and the appearance is that of some solid organ shining through. Their exact position is variable; they may even be near the middle line, internal to the line of the ventral setae.

The female pores are in groove 11/12, in line with setae *b*.

The spermathecal pores are in 7/8, immediately below the line *c*.

Internal Anatomy:—Septa 5/6 to 8/9 are moderately strengthened; the rest are thin.

There are four gizzards, in segments xiv to xvii. In the second specimen dissected, that in xvii was notably smaller than the others; and in xiii there were numerous longitudinal shining muscular bundles on the oesophagus, forming a rudimentary gizzard here also.

The last heart is in segment ix.

The testis sacs vary in shape; in the first specimen dissected they were rather kidney-shaped, with the hilus directed downwards and outwards, and the anterior ends rather narrower than the posterior; they were suspended by septum 9/10, almost by their middle, the posterior portion in x being rather larger than the anterior in ix; in the second, they were rounded smooth masses, unconstricted, mostly (practically altogether on the right side) in segment x. When opened, the contents were with difficulty evacuated, and even then only in part; a large portion of the inner surface of the sac appeared to be proliferating the sexual cells, *i.e.* the testis is diffuse; a firmer though not iridescent mass on the floor of the sac, just over the site of origin of the vas deferens, appeared to indicate the position of the funnel.

The vas deferens is either considerably or not much coiled; passing downwards from the under surface of the sac it runs part of its course in segment ix, and then enters the anterior border of the prostate in x.

The prostate is of moderate size only, flattish, sessile on the body-wall, its transverse rather greater than its longitudinal axis; its surface is quite soft and furry ("glandular").

Segment xi constitutes a perfectly closed annular ovarian chamber. The ovisacs pass backwards from the hinder wall of the chamber through segments xii and xiii, and may get into xiv; their margins may have a crenulated appearance or not.

The spermathecae are situated in segment viii. The ampulla is globular or broadly ovoid, dorsally situated in the segment, and connected by a band with the one of the other side. The duct is much convoluted as it passes down on the posterior face of septum 7/8. There is no diverticulum or atrial sac, not even in the body-wall, though the duct is slightly thickened at its termination.

Remarks:—The two species of *Drawida* to which the present specimens bear most resemblance are *D. bournei* (Mchlsn.) and *D. barwelli* (Bedd.). From the first the present form differs (besides a few minor details) in the shape of the testis sacs (not a great matter, since this is variable in these specimens), in its much smaller size, and especially in the fact that the surface of the prostates is "glandular." From the second, it differs in a few details such as the number and situation of the gizzards (points which are however very variable), the relative magnitude of the setal intervals, and the shape of the prostates (pear-shaped in *D. barwelli*, almost circular, flat and sessile in the present form); the chief difference however is the absence of dorsal pores here,—a character which the varietal name is intended to indicate. Most of the species of *Drawida* have no dorsal pores; the type form of *D. barwelli*, however, is peculiar in possessing them. I have rejected the alliance of the present form with *D. bournei* (itself, according to Michaelsen, 4, a variety of *D. pellucidus*), because the smooth and shiny, or soft and furry, condition of the surface of the prostate is apparently a distinction of some importance (*cf.* Michaelsen, in the paper just quoted).

The diagnosis of the present variety may run as follows: *Drawida barwelli* var. *impertusus*:—as for the typical form, with the following exceptions. Setal interval *aa* rather less than *bc*, except at the hinder end. Male pores bounded by very prominent anterior and posterior lips; a pair of indefinite but fairly large whitish papillae on the segment in front of the male pores. No dorsal pores. Four gizzards, in xiv—xvii. Prostates flat, sessile, almost circular.

Fam. MEGASCOLECIDAE.

Subfam. *MEGASCOLECINAE.*

Genus **Pontodrilus.**

Elephanta Island, Bombay; on the sea-shore. 30-vi-1917. B. Prashad. A single specimen, not fully mature.

The species was presumably the one which has been found on several parts of the coast of India, *P. bermudensis*, Bedd. f. *ephippiger* (Rosa).

Genus **Megascolides.**

Megascolides prashadi, sp. nov.

Plate IX, figs. 5, 6.

Sakarwari, on the way to Mahableshwar, W. India 4-vii-1917. B. Prashad. A single specimen.

External Characters:—Length 42 mm., diameter 4 mm. The worm is unpigmented, of a buff colour, which is lighter at the ends of the body and in the clitellar region. Segments 140; the last 60 however are very short and lighter in colour, and have perhaps been regenerated.

The prostomium is prolobous.

The dorsal pores begin at the anterior border of the clitellum, in groove 12/13.

The setae are paired. In the middle of the body the relative size of the intervals may be expressed by the formula $ab = \frac{2}{7}aa = \frac{2}{5}bc = \frac{4}{5}cd$; behind the clitellum

this becomes $ab = \frac{2}{7}aa = \frac{1}{3}bc = \frac{3}{4}cd$; and in front of the clitellum $ab = \frac{2}{7}aa = \frac{2}{7}bc = \frac{3}{4}cd$. The mid-dorsal interval *dd* is in the middle of the body equal to about half the circumference.

The clitellum is smooth, thickened, well-defined at each end, and extends over segments xiii—xvii (= 5).

The male pores are on segment xviii, just outside the line of setae *b*. They are small, and surrounded by only a slight whitish thickening.

On segment xix is a large flat oval papilla (fig. 5); this is not quite symmetrically placed, being rather on the left side, so that while it reaches as far outwards as the male pore on the left side, it stops somewhat short of this on the right; its centre shows a transverse, almost groove-like, depression. On segment xx is a second papilla, much smaller and less definite than the last, transversely elongated, with its centre about in line with the setae *a*, extending inwards to about the middle line; like the last, it is situated on the left side.

Segment xvii is delimited in front by a groove mid-ventrally, but not elsewhere, since this segment forms part of the clitellum; on this ventral portion are seen a few small whitish circular spots, which however do not seem to have anything to do with setae. Setae *a* and *b* are absent on segments xviii and xix, and on the left side on xx.

The female pore seems to be represented by a small white dot mid-ventrally placed on xiv.

The spermathecal pores are a single pair, in groove 7/8, in or immediately outside the line of setae *b*.

On the hinder border of segment viii are situated a pair of indefinite, transversely oval papillae, in position and size corresponding to the setal interval *ab*.

Internal Anatomy :—Septum 4/5 is slightly thickened as compared with those in the middle of the body; 5/6 and all the following septa down to 10/11 are moderately thickened; 11/12 again is only slightly strengthened.

The gizzard, in segment v, is subspherical and of moderate size. There are no calcareous glands. The intestine begins in xv, or perhaps in xvi.

The last heart is in segment xii.

Behind the clitellum the micronephridia are arranged in transverse rows of about eight to ten on each side; in the clitellar region they are also in transverse rows, and somewhat larger; in front of this they are sparser, and their arrangement is less regular. About forty segments from the hinder end the innermost nephridium on each side in each segment enlarges, and this condition is maintained to the end; there is thus a longitudinal row of larger nephridia on each side of the ventral nerve cord, but I do not think that these could be described by anyone as meganephridia, —only as enlarged micronephridia.

Testes and funnels are free in segments x and xi; the funnels were inferred from the iridescent masses which probably enclose them; the testes were separately identifiable in xi, while in x they were presumably continuous with a deeply attached mass of flocculent matter (developing sperm-morulae and spermatozoa).

Three pairs of seminal vesicles are present. The largest are those in xii, of moderate size and lobulated; in segment ix is a second pair, rather smaller and also lobulated; the third pair, in x, are smaller still, and attached to septum 10/11.

The prostates are tubular, and consist of a number of thick, adpressed opaque coils which extend through several segments. The duct is relatively short, proceeds almost straight inwards, and is narrow but broadens slightly towards its ectal end.

Ovaries and funnels have the usual situation.

The spermathecae are one pair. The ampulla is a large irregular sac, with much crenulated margins (fig. 6); the duct is about as long as the ampulla, of moderate thickness and approximately the same diameter throughout. There is a single diverticulum, originating at the ental end of the duct, lobulated, about half as long as the duct, to the side of which it is adherent.

There are no penial setae.

Genus **Perionyx**.

Perionyx sansibaricus, Mchlsn.

Plate IX, fig. 7.

Manmad, Bombay Pres. 28-vi-1917. B. Prashad. Numerous specimens.

Igatpuri, Bombay Pres. 29-vi-1917. B. Prashad. Two specimens.

Khandwa, Central Provinces. 23-vi-1917. B. Prashad. Numerous specimens

Kala Khund, between Khandwa and Indore, Central India. 23-vi-1917. B. Prashad. Three specimens.

Baroda, W. India, on the banks of the river Vishvamitri. 9-vii-1917. B. Prashad. A single specimen.

Wathur, near Mahableshwar, W. India. 6-vii-1917. B. Prashad. Nine specimens.

Londa, ten miles from Castle Rock, Bombay Pres. 6-vii-1917. B. Prashad. Eleven specimens.

This interesting species has been previously recorded from Kodaikanal in the Palni Hills (Michaelsen, **3**). From the present records it appears to be common in Western India. One of its distinguishing characters is the alternation in situation of the terminal bladders and external openings of the nephridia; these are placed at about one-third of the half circumference from the mid-dorsal line, and a similar distance from the mid-ventral line, in successive segments; as the end bladders are easily seen on opening the animal (unlike most species, where they are small or absent), the peculiarity is obvious in any dissection. The alternation is however, according to my dissections, approximate, not exact; two successive nephridia not uncommonly end at the same level on the body-wall, and once a series of four were seen to do so.

I append a few notes on the numerous specimens with which I have had to deal.

External Characters:—The purple colour of the dorsal surface extends partly on to the ventral side of the animal in the most anterior segments. I found this character of help in separating worms of this species from others when several species were mixed together in a single catch.

The dorsal pores, which Michaelsen found to begin in groove 9/10 or 8/9 in his

original single specimen, and in 4/5 in the examples from the Palni Hills, begin here in 3/4, remarkably far forward.

The region of the male pores is characteristic (fig. 7). Segment xviii is somewhat lengthened in the mid-ventral region, its anterior and posterior limits being bulged forwards and backwards respectively. The male apertures are small transverse slits close to the middle line; while in front and behind the pores there is a crescentic depression, the convexity of the depressions facing forwards and backwards respectively, and causing the bulging, forwards and backwards, of the intersegmental grooves; the pores are thus situated on a transverse ridge between the crescentic depressions. A characteristic feature is that the setal ring is not interrupted by the pores, but is continued across the segment, on the ridge but just behind the male pores.

Internal Anatomy:—I find the gizzard to be in segment vi (Michaelsen in v); it is very rudimentary. The intestine is somewhat swollen in xiii, but not specially vascular, nor are there any ridges in the interior.

Testes and funnels are free in segments x and xi. Besides the seminal vesicles in segments xi and xii, there was in one specimen dissected a minute structure in ix, on the left side and attached to the anterior face of septum 9/10, consisting of two small ovoid lobules, and perhaps representing a rudimentary vesicle. The vesicles in xii were larger than those in xi, and were somewhat lobulated; those in xi were markedly so.

The ampulla of the spermathecae is pear-shaped, narrowing towards the ectal end to a duct; this is short, relatively narrow, cylindrical, one-third as long and one-fourth as wide as the ampulla. There is a single diverticulum, on the inner side of the duct, consisting of a few indistinct seminal chambers aggregated together on a short stalk; the diverticulum is one-fourth the length of the ampulla.

Perionyx millardi, Stephenson.

Plate IX, fig. 8.

Bombay, Malabar Hill. 1-vii-1917. B. Prashad. Three specimens.

Talegaon, on the way to Poona. 2-vii-1917. B. Prashad. A single specimen.

Kalyan, a short distance inland from Bombay, Bombay Pres. 7-vii-1917. B. Prashad. Four specimens.

Virar, N. of Bombay, Bombay Pres. 7-vii-1917. B. Prashad. A single specimen.

The present species was described by me (**11**) from three specimens from Malabar Hill, Bombay; these were however much softened and in bad condition, and a few supplementary notes may therefore be of interest.

The lengths of the specimens which have now come to hand show rather greater variation than those of the original batch; these are from 35 mm. (though this was perhaps regenerated at its hinder end) to 90 mm.

The ventral break in the setal rings is very small,—about $1\frac{1}{3}$ *ab*,—but it is regular from the clitellum backwards. The dorsal break is very irregular, small or absent, and often not in the middle line. The setae are slightly closer set, and certainly more

regularly placed, ventrally than dorsally. The numbers counted were :—ix/40, xii/41, xix/48, and in the middle of the body 41.

No septa are thickened.

The gizzard, in segment vi, is of some size, but its walls are thin and soft.

The seminal vesicles of segment xii are larger than those of xi, and bulge back the posterior septum of the segment; they may even extend backwards so as to bulge back septum 13/14. Both pairs are smooth and scarcely or not at all lobed.

The prostates may take up fully two segments,—xviii and xix, bulging septum 17/18 forwards and 19/20 backwards. The border of the gland is not cut up into lobes, except by an indentation on the anterior margin, and by a deep notch from which the duct emerges. The duct is quite straight, soft and only slightly shiny, and of equal diameter throughout; it passes directly inwards.

The chief difference between these specimens and those formerly described is in the spermathecae; all the specimens of the present series which were dissected possess a diverticulum, thus differing from the previous examples, in which I found none. In these, the ampulla is a large ovoid sac; the duct is much shorter than the ampulla, from which it is distinctly marked off, narrow and of the same diameter throughout. There is a single diverticulum, which varies in its appearance; regarding the specimens from Malabar Hill, Bombay (whence the original examples of the species also came), all that can be said is that there appears to be a small scale-like diverticulum from the base of the ampulla; in that from Virar the diverticulum arises from the junction of duct and ampulla, is small, rather scale-like and flattened, and lies against the base of the ampulla (fig. 8*a*); in that from Talegaon it is rather flat, sessile, somewhat cauliflower like, showing a number of small seminal chambers (fig. 8*b*). In the specimens from Kalyan the whole organ is of a rather different appearance; the ampulla is somewhat lobed, and has a fairly broad base, from which the duct issues; the diverticulum is larger than in the previous specimens, and is divided into three lobules lying side by side; indeed the incisions between the lobules appear to be so deep that each lobule has its own attachment to the upper end of the duct, *i.e.* there are really three diverticula (fig. 8*c*). Since however the whole of the anatomy, including the penial setae, is the same in these latter specimens as in the others, it scarcely seems allowable to separate them. The absence of any diverticulum in the original specimens is perhaps due to their relative immaturity.

Perionyx rimatus, sp. nov.

Plate IX, fig. 9.

Jor Pokhri, 4,800 ft., Sitong, Darjiling Dist., E. Himalayas. 22–28-x-1917. N. Annandale and F. Gravely. Two specimens, one mutilated.

External Characters :—Length 80 mm.; diameter 4·5 mm. Colour in the anterior part of the body a light rather blotchy purple on the dorsal side, pale in the posterior half except for a purple middorsal stripe; ventrally pale throughout.

The body is rather flattened, and the clitellum is narrowed. Segments 107.

Prostomium epilobous $\frac{1}{2}$; a faint groove delimiting the prostomium behind.

Dorsal pores from 4/5.

The setal rings are often closed both dorsally and ventrally; sometimes there is a small break, but it is irregular and varying in extent,—not more than *2ab* or *2yz*, and often less. The setae are rather small,--smaller and closer set on the ventral than on the dorsal surface. The following numbers were counted:—v/59, ix/63, xii/64, xix/56, and in the middle of the body 56.

The clitellum extends over segments xiii–xvi = 4; it is narrowed, rather lighter in colour, with visible dorsal pores and intersegmental grooves.

On segment xviii is a deep transverse crack with corrugated anterior and posterior lips, situated in the middle of the length of the segment and extending transversely over the middle half of the ventral surface. It is difficult to see the male pores in this groove, but they appear to be near its centre, and only separated by a slight median elevation in the floor of the groove.

The female area is a median whitish circular patch anteriorly on segment xiv.

The spermathecal apertures are two pairs, in grooves 6/7 and 7/8; they are small, with slightly puckered lips, rather close together, about in line with seta *c* or the space *cd*.

There are no other genital marks.

Internal Anatomy:—Septa 4/5, 5/6 and 6/7 are thin, but increase slightly in thickness progressively; 7/8 is somewhat strengthened, and 8/9 moderately so. Thence to the prostatic region all are slightly, but none much, strengthened,—10/11 is perhaps least so.

The gizzard is small and rudimentary, in segment v. The intestine begins behind the prostates.

The last heart is in segment xiii.

The nephridia end in the same line.

Testis sacs are present in segments x and xi. In x the sac is lobed, distinctly though not deeply, and presents the appearance of a number of ovoid lobes lying side by side in transverse series; it is continuous below the oesophagus from side to side, encloses both oesophagus and hearts, and appears to be divided dorsally by a median septum above the alimentary canal. In xi the sac is smaller, and lies posterior and ventrally to the vesiculae seminales.

The seminal vesicles, in segments xi and xii, have a granular surface but are not otherwise lobed. Each pair is fused dorsally over the alimentary canal, so as to form a single sac in each segment; that in xi overlies the testis sac deeper in the segment, —it is not an extension of the testis sac (as is described for *P. himalayanus* by Michaelsen, **3**), but has an independent attachment to the posterior face of septum 10/11. In an earlier stage of development, exemplified by the second of the two specimens, the sac of segment x is smaller, and does not include the alimentary canal and hearts; it grows up round them, it would appear, during its formation.

The prostates are large, occupying segments xviii and xix, and it may be part of xvii also; they are deeply cut up by the septa, and also otherwise much indented.

The duct is much twisted and relatively thin, not firm and shining; its ectal end is rather stouter than the rest.

There are two pairs of spermathecae (fig. 9). The organs occupy the whole available space in segments vii and viii, and meet dorsally. The ampulla is a large irregular sac, with bulgings here and there; the duct is moderately stout, half as long as the ampulla, not firm or shining. The diverticula are in the form of a few small warts on the duct a short way below the base of the ampulla; these form a cluster, about half a dozen in all, of which one appears to be larger than the rest; the smaller hardly project at all, but the iridescent spermatozoa shine through.

There are no penial setae.

Remarks:—I was at first inclined to identify this form as *Perionyx himalayanus* (Michaelsen, **3**), on the ground of its possessing testis sacs,—a rather unusual feature in this genus. There is also the fact that the present specimens come from the same district (Darjiling Dist.) as *P. himalayanus*, and that both are much paler in colour than is general in this genus. But, neglecting slighter differences such as the distribution of the thickened septa, the character of the prostatic duct, the numbers of the setae, and the extent of the dorsal pores, there remain essential differences in the extent of the clitellum, the spermathecal diverticula, and especially the configuration of the male area. In *P. himalayanus* the male pores are situated on large round papillae which are quite at the sides of the ventral aspect, one-fifth of the circumference apart from each other; and a number of setae intervene between the two papillae. Here the pores are situated near each other in the depth of a transverse crack.

Though both species possess testis sacs, it is possible that their relations to the seminal vesicles are not the same. In *P. himalayanus* the sperm sacs are apparently prolonged laterally to form seminal vesicles in segments x and xi; here there is no such prolongation in segment x, seminal vesicles being absent in this segment; and the seminal vesicles of xi are independent of the testis sacs, and have their own attachment to the anterior septum of the segment.

Perionyx pokhrianus, sp. nov.

Plate IX, figs. 10, 11.

Jor Pokhri, 4,800 ft., Sitong, Darjiling Dist., E. Himalayas. 22–28-x-1917. N. Annandale and F. Gravely. A single specimen (along with the last).

External Characters:—Length 65 mm.; diameter 3 mm. Colour pale violet dorsally,—posteriorly paler than in front; a mid-dorsal darker stripe; ventral surface unpigmented. Segments 96.

Prostomium epilobous $\frac{1}{2}$, the tongue (posterior portion projecting into segment i) not cut off by a groove behind.

Dorsal pores begin from groove 4/5.

The setae are in rings, which are almost closed both dorsally and ventrally, and may be quite closed in the hinder part of the body; *aa* or *zz* = $1\frac{1}{4}$ or $1\frac{1}{2}$ times *ab* or

yz. The setae are set slightly closer ventrally than dorsally. The following numbers were counted:—v/50, ix/58, xii/54, xix/48, and in the middle of the body 44.

The clitellum is narrowed, and extends over segments xiii-xvi (= 4). It is lighter in colour than the neighbouring segments, and the intersegmental grooves and setae are visible.

The male field occupies the middle of segment xviii. Here are seen a pair of papillae which take up the greater part of the length of the segment (fig. 10); they are bounded both in front and behind by a common transverse or slightly crescentic groove, the anterior groove being the better marked, and are separated from each other by a longitudinal groove in the middle line. On their outer margins the papillae are not delimited from the surrounding area. The male pores are near the middle line, and nearer the posterior than the anterior border of the papillae.

The female aperture is situated in a small median circular depression, close to the anterior border of segment xiv.

The spermathecal apertures are in grooves 6/7 and 7/8, very close together, nearly in line with seta *b*.

Internal Anatomy :—The first few septa (4/5-6/7) are very thin; none are missing, and none are markedly thickened, though 8/9, 9/10, 12/13, and 13/14 are slightly stronger than the others.

The gizzard, in segment v, is large and barrel-shaped; it is rather soft, but by no means vestigial. The intestine begins in xviii, but is compressed between the prostates in xviii and xix.

The last heart is in segment xiii.

The terminations of the nephridia are apparently in the same line.

Testis sacs are present in segments x and xi; both are continuous dorsally over the oesophagus and dorsal vessel. That in segment x is very delicate, and has somewhat the appearance of a seminal vesicle; that in xi, also delicate, is covered by the seminal vesicles of the segment, to which the sac is adherent, though it can be separated.

The seminal vesicles, in xi and xii, are large, and have a granular surface, but are not otherwise lobed. In xi the two vesicles are adherent in the middle line, though they are separable without damage; those in xii merely touch each other.

The prostates are large, and take up the whole of the three segments xvii-xix; they are deeply incised by the septa, and also otherwise indented. The duct is rather short, soft, irregularly twisted, and thin, but somewhat dilated at its extreme ectal end.

The female organs have the usual position.

The spermathecal ampulla is a very irregularly lobed sac (fig. 11). The duct is short,—one-fourth or one-fifth the length of the ampulla,—and marked off by a constriction at its beginning. The diverticula are small swellings, three or so in number, side by side on the upper half of the duct; they have a metallic appearance, due to the iridescent spermatozoa shining through.

There are no penial setae.

Remarks :—Here again, in the pale colour and the testis sacs, there is a resemblance to *P. himalayanus*. But here too the differences seem to be too great to allow us to unite the two forms in a single species. Apart from less important features such as the numbers of the setae and the extent of the dorsal pores, we have to consider the extent of the clitellum, the much greater development of the gizzard in the present form, and especially the quite different configuration of the male field and the much greater approximation of the pores.

var. **affinis,** var. nov.

Plate IX, figs. 12, 13.

Sitong Ridge, alt. ca. 4,700 ft., Darjiling Dist., E. Himalayas. 22-28-x-1917. N. Annandale and F. Gravely. Two specimens, one not fully mature.

Jor Pokhri, 4,800 ft., Sitong, Darjiling Dist., E. Himalayas. 22–28-x-1917. N. Annandale and F. Gravely. A single specimen.

External Characters :—Length 55 mm. ; diameter 2·25 mm. A slight slaty or purplish tinge dorsally, with well-marked median darker stripe ; pale ventrally. Segments 105.

Prostomium epilobous $\frac{2}{3}$, the tongue not cut off behind.

Dorsal pores begin from 4/5.

The setal rings are almost unbroken both dorsally and ventrally ; the ventral break is absent or practically so throughout, and there is no dorsal break in the hinder part of the body ; anteriorly a small break exists on the dorsal side, where *zz* $=1\frac{1}{4}yz$. The setae are closer set ventrally than dorsally. The following numbers were counted :—v/38, ix/44, xii/45, xix/37, and in the middle of the body 36.

The clitellum extends over four segments, xiii to xvi ; it is narrowed, but not much modified otherwise.

The male field (fig. 12), on segment xviii, consists of a depression with sloping sides ; on these sides are placed the papillae with the male pores, so that these face somewhat inwards. The papillae are rather wider transversely, are delimited by grooves in front and behind, the grooves in front being the better marked ; and are separated in the middle line by a slight interval, while laterally they fade away into the general surface without any definite delimitation. The apertures are small transverse slits, their centres in line with seta *c*.

The female aperture is marked by a median roundish pit anteriorly on segment xiv, abutting on groove 13/14.

The spermathecal pores are in grooves 6/7 and 7/8, opposite the interval *cd*.

Internal Anatomy :—A number of septa in the anterior part of the body are slightly thickened, but none more than slightly.

The gizzard is in segment v, and is of moderate size and fairly firm. The intestine begins perhaps in xviii, but is narrow in xviii and xix, where it is compressed by the prostates.

The last heart is in xii.

The ducts of the nephridia appear to end at different levels on the body-wall ;

but, since there are no end-bladders as in *P. sansibaricus*, it is not always easy to see where exactly they end, and in any case there is no regular alternation.

It is difficult in some of the examples of this and the last few species to demonstrate the testis sacs to complete satisfaction. Here they seem to be present in segment x, the mass of developing spermatozoa being covered over by a thin filmy membrane; the sacs of the two sides are probably continuous beneath the gut. In segment xi the testis sac is continuous on each side with the seminal vesicle.

The seminal vesicles are in segments xi and xii; they are large, taking up the whole available space, with a granular surface but not otherwise lobed; there is no indication of separation dorsally,—the pair in each segment is completely fused.

The prostates are large, and take up the whole of three segments, xvii to xix; they are deeply indented by the septa, and also otherwise much cut up. The duct is moderately long, is bent with the angle directed backwards, is soft and rather thin in its ental, thicker and shining in its ectal portion.

The female organs have the usual situation.

The spermathecae, in segments vii and viii, have each a large irregularly lobed sac-like ampulla, which is as broad as long. The duct is stout, slightly shiny, well marked off from the ampulla, about half as broad as the ampulla but considerably longer,— $1\frac{1}{2}$ times as long (fig. 13). The diverticulum appears as a rounded knob at the ental end of the duct, with two small masses of iridescent spermatozoa shining through.

There are no penial setae.

Remarks :—The above is the description of the more mature of the two specimens from Sitong Ridge. The specimen from Jor Pokhri differed slightly; thus the papillae bearing the male pores, and so the male pores themselves, were rather further apart,—opposite setae *d* instead of *c*, and separated by perhaps one-seventh of the circumference as against one-twelfth in the specimen described above; the depression containing the papillae was less marked; and the spermathecal pores were wider apart,—opposite setae *d* or *e* instead of the interval *cd*.

The closest relative of the present form is certainly the species last described. In this, the numbers of the setae are smaller, and the configuration of the male field and the degree of separation of the male and spermathecal apertures also differ. The most important points however are the spermathecae (the figures show the great difference in the relative length of the duct), and the position of the last heart (in xii here, in xiii in the last form).

It is difficult, in cases such as this, where a number of related forms have apparently arisen recently, or are possibly yet in process of differentiation, to know when the degree of differentiation which justifies the creation of a new species has been attained. Had this form been found at a distance from *P. pokhrianus*, its separation as a different species might perhaps have been justifiable; so far as the recollection of my own experience goes, the position of the last heart does not, I believe, vary within the limits of recognized species. (But see description of *Octochaetus prashadi*, *post.* p. 233).

Perionyx alatus, sp. nov.

Plate IX, figs. 14-16.

Sitong Ridge, alt. ca. 4,700, ft. ; Darjiling Dist., E. Himalayas. 22–28-x-1917. N. Annandale and F. Gravely. Three specimens.

External Characters :—Length 84 mm. ; diameter 3 mm. Colour dusky purple dorsally ; pale, slightly brownish below. Segments 123.

Prostomium epilobous $\frac{1}{3}$, tongue not closed behind.

Dorsal pores begin from groove 4/5.

The setal rings are closed dorsally and ventrally ; the setae are closer set ventrally. The following numbers were counted :—v/50, ix/55, xii/ca. 54, xix/50, and in the middle of the body ca. 52.

The clitellum extends from segment xiii as far as the anterior third of xvii ($=4\frac{1}{3}$). It is slightly lighter in colour, and is the same diameter as the rest of the body ; setae and intersegmental grooves are visible.

The male field takes up the whole of the ventral surface of segment xviii (fig. 14). Its rounded lateral borders occupy the ventro-lateral region of the segment, and its anterior and posterior borders correspond with the limits of the segment. Its chief feature is the presence of a pair of large transversely elongated papillae, conjoined by a narrow neck in the middle line, their outer ends rather narrower, and their margins crenulated. The conjoined papillae are surrounded by a deep groove or moat. The male pores appear as transverse grooves in the broader, inner part of the papillae ; the actual openings seem to be at about the middle of the grooves, the distance between them being approximately one-fourth of the transverse extent of the visible ventral surface, as seen looking down on it. The penial setae are seen as a number of black dots in the grooves.

The female aperture is represented by a mid-ventral small depression anteriorly on segment xiv.

The spermathecal pores are two pairs, in grooves 6/7 and 7/8, the same distance apart as the male pores, about in line with the setal interval *de*.

Internal Anatomy :—No septa are visible in front of 5/6, which is very thin ; none are notably thickened, though 6/7, 7/8, and 8/9 are slightly so.

The gizzard, in segment v, is large, long from front to back, cylindrical, and rather soft. The intestine begins behind the prostates, in segment xx.

The last heart is in segment xiii.

The nephridia end in the same line.

Testis sacs are present in segments x and xi. In segment xi they lie beneath the seminal vesicles, to which they are adherent, though it does not seem that their cavities are continuous ; the membrane which constitutes the sac is fine, and rather indefinite, and there is some matting together of all the structures, including the hearts, as if all were enclosed in organizing connective tissue. In segment x the condition is similar ; the testis sac is adherent to the seminal vesicle, which spreads over it from the segment behind.

The seminal vesicles belong to segments xi and xii. Those of a segment are fused together dorsally over the alimentary canal without any hint of a division; as already mentioned, the vesicle of xi extends forwards dorsally over x as well.

The prostates are large, occupying segments xvii to xix. They are cut up by the septa, and also otherwise indented into numerous lobes. The duct is irregularly twisted, soft, moderately long, and its ectal portion is wider than its commencement.

The female organs have the usual situation.

The spermathecae lie in segments vii and viii; the posterior pair are the larger. The ampulla is a considerable sac, with smooth surface, not indented. The duct is separated by a constriction, and is slightly swollen below the constriction; it is very stout,—one-third as thick as the ampulla, or even at its upper end quite half as thick: its length is about two-thirds that of the ampulla. Its swollen upper part corresponds to the diverticulum, and spermatozoa can be seen shining through in small patches, but there are no definite seminal chambers (fig. 15).

The penial setae (fig. 16) are 1·08 mm. in length, and 20· in thickness. The shaft is almost straight for the greater part of its length, but has a sharp curve at its proximal end, resembling that of a hockey stick, and is more gently curved towards the tip. The point is blunt; and the ornamentation consists of irregularly scattered minute spines on the distal portion of the shaft.

Remarks :—This species belongs to the same group as the preceding (presence of testis sacs, and character of the spermathecal diverticula). It is however well differentiated by the presence of penial setae, and the characteristic conformation of the male genital field; the specific name refers to the large wing-like papillae of this region.

Perionyx shillongensis, sp. nov.

Plate IX, fig. 17.

Shillong, Assam; 4,500–5,000 ft. 16–20-iv-1918. N. Annandale. Two specimens.

External Characters :—Length 66 mm.; diameter 3 mm. Colour a dusky purple dorsally, passing through violet to the pale unpigmented ventral surface. Segments 120. The animal is circular in transverse section (the species of the genus are usually more or less flattened dorso-ventrally).

Prostomium epilobous $\frac{1}{2}$, tongue not cut off behind.

Dorsal pores begin from groove 3/4.

The setal rings present a very small and rather irregular dorsal break ($zz = 1\frac{1}{4}yz$), absent altogether in the hinder part of the body; and a small ventral break ($1\frac{1}{4}ab$), more regular than the dorsal but absent in the posterior third. The setae are rather more closely set ventrally. The following numbers were counted :—v/42, ix/46, xii/49, xix/48, and in the middle of the body 48.

The clitellum extends over five segments, xiii to xvii; it is very slightly swollen, and there is a slight difference in tint, but this region is otherwise unaltered.

The male field is a white, rather swollen, transversely elongated oval area on the ventral surface of segment xviii, about two and a half times as broad as long, and

taking up the length of the segment. The pores are fairly conspicuous, rather close together, about in line with the setal interval *cd*.

The female pore is apparently situated in a small whitish area anteriorly on segment xiv.

The spermathecal apertures are situated in grooves 7/8 and 8/9, about the same distance apart as the male pores or slightly closer, in line with the interval *bc*.

Internal Anatomy :—The septa of the anterior part of the body as far back as the prostatic region are slightly thickened, with the exception of the first, 4/5, which is very thin ; perhaps 6/7–9/10 are most thickened.

The gizzard, in segment vi, is of fair size ; the walls are somewhat, but not very, soft, and it must be reckoned as well developed for a species of this genus.

The intestine begins in segment xvi ; no calciferous glands were seen.

The last heart is in segment xii.

The ducts of the nephridia end in approximately the same line.

Testes and large funnels are free in segments x and xi.

The seminal vesicles are in xi and xii ; they are large, and bulge out the segments in which they are contained, those in xii pressing back septum 12/13 to the level of 13/14. They are smooth and not cut up into lobes. Those in xii meet dorsally but do not fuse ; those in xi actually fuse in the posterior part of the segment.

The prostates are of moderate size, and are confined to segment xviii, though bulging the septa forwards and backwards to some extent. The surface is indented so as to form a number of lobes. The duct comes off from a hilus on the inner side, is short and straight, and though moderately stout is soft and without muscular glitter.

The ovaries and funnels are in segment xiii. Tiny white subspherical appendages by the side of the alimentary canal on the anterior wall of segment xiv appear to be ovisacs.

The spermathecae, in segments viii and ix, are large, and fill out their respective segments. The ampulla is an ovoid sac. The duct is half as long and almost half as thick as the ampulla,—that is, relatively very stout. The diverticula are present as two clusters of seminal chambers on the duct just below the base of the ampulla ; each cluster is cauliflower-like, and sessile by a broad base ; the clusters leave the postero-internal and anterior or antero-internal aspects of the duct free (fig. 17).

The penial setae are ·87 mm. long, and 20μ thick. The shaft is straight, the tip slightly bowed and bluntly pointed. The ornamentation consists of about eight rings of rather fine spines ; there may be a very fine ninth or even tenth ring.

Perionyx fossus, sp. nov.

Plate IX, fig. 18, 19.

Shillong, Assam ; 4,500–5,000 ft. 16–20-iv-1918. N. Annandale. A single specimen.

External Characters :—Length 86 mm. ; diameter 3·5 mm. Colour a dusky purple dorsally, pale and unpigmented ventrally, the upper tint shading off rather gradually into the lower. Segments 136. The body here again is circular in transverse section.

Prostomium epilobous $\frac{3}{4}$, tongue cut off behind.

Dorsal pores begin from groove 4/5.

The setal rings are interrupted dorsally ; $zz = 2yz$ behind the genital region, but is rather less elsewhere,—in general about $1\frac{1}{2}yz$; the interval is regular, and the setae z are in longitudinal lines. There is no ventral break. The ventral setae are much closer set than the dorsal. The following numbers were counted :—v/52, ix/56, xii/56, xix/52, and in the middle of the body 54.

The clitellum extends over half of segment xiii in front and one-third of xvii behind ($=3\frac{5}{6}$). It is smooth, rather lighter in colour, and retains both the setae and intersegmental grooves.

The male field is a deep squarish depression midventrally on xviii, which takes up the whole length of the segment, and is about one-third of the ventral surface in transverse extent. The anterior wall of the depression is vertical, the posterior slopes more gently ; the sides are steeper than the posterior, but not so steep as the anterior wall. Across the floor and sides of the excavation extends a transverse groove—very narrow, a crack only. The male apertures appear to be situated in this crack, at the junction of the floor and side walls of the depression ; they are thus fairly close together, and about in line with seta *d* or *e*.

The female pore is indicated by a slight depression in a rather pale circular area, between the setal zone and anterior margin of segment xiv.

The spermathecal pores are two pairs, in grooves 7/8 and 8/9, fairly wide apart, —separated by about a quarter of the circumference, or in line with about the ninth seta from the middle line.

Internal Anatomy :—No septa are notably thickened ; perhaps 9/10 is most so. The first is 4/5.

There is a rather large but soft gizzard in segment vi. There are no calcareous glands, but the oesophagus shows the traces of transverse vascular channels in segment xiii, though the tube is not wider here than in neighbouring segments. The intestine begins in xvii.

The last heart is in segment xiii.

The nephridial ducts end in the same line.

Testes and funnels are free in segments x and xi.

The seminal vesicles in segment xi are quite fused together dorsally, and fill out the whole of the segment. Those which belong to segment xii are similarly fused,— in their hinder parts at any rate ; they pass beyond the limits of segment xii and form a large mass which extends to the hinder end of xiii.

The prostates are large compact masses, which bulge the septa of segment xviii forwards and backwards, and in this way take up a space of three or four segments. The gland is but little cut up into lobes. The duct emerges from a deep cleft on the inner surface ; it is narrow and bent once or twice while still within this cleft, broadens on emerging, and becomes fairly stout and shining in its ectal portion.

The spermathecae fill out all available space in segments viii and ix. The ampulla is irregularly ovoid in shape, and the duct is half as long and quite one-third as

thick as the ampulla. The diverticula are rather inconspicuous ; they are small flattish swellings on the duct at about the middle of its length, two in number, sessile, and lobulated (fig. 18).

The penial setae (fig. 19) are very little modified. In length they are ·45 mm., in thickness 18μ ; their shape is that of an ordinary seta, with the usual double curve. The tip is fairly sharply pointed, and there is no nodulus. The margin shows a few small indentations near the tip.

Perionyx turaensis, sp. nov.

Plate X, figs. 20, 21.

Above Tura, Garo Hills, Assam ; 3,500–3,900 ft. ; under bark. July–August 1917. S. Kemp. Five specimens and two fragments.

External Characters :—Length variable, but the differences are probably due to fragmentation. The animal seems to break up easily ; one specimen shows a regenerated zone at the hinder end. The longest specimen, apparently complete, measured 74 mm.; diameter 2 mm. Colour dark brownish purple dorsally, with still darker median stripe ; ventral surface unpigmented. Segments 132. The ventral surface is somewhat flattened.

Prostomium epilobous $\frac{1}{2}$ or rather more, with squarish posterior tongue, which may or may not be demarcated behind.

Dorsal pores from groove 4/5 or 5/6.

The setal rings are almost closed ventrally ; on the dorsal side *zz* may be twice *yz* in front of the clitellum, but is less behind. The setae are closer set ventrally, and the ventral setae appear smaller than those on the dorsal side. The numbers are difficult to count, and there are intervals where some seem to have dropped out, so that the following are estimates only :—v/48, ix/56, xii/54, xix/44, and in the middle of the body 55.

The clitellum is rather narrowed ; it includes two-thirds of segment xiii and extends back to the hinder border of xvii ($=4\frac{2}{3}$). The intersegmental furrows are not obliterated.

The male pores are on xviii, close together near the middle line, on small round papillae. The papillae touch each other or almost so, and are situated in a slight common depression, rectangular or transversely oval in shape, which does not take up the whole length of the segment.

The female pore is single, and appears as a simple depression or as a transverse slit in front of the setal zone of segment xiv.

The spermathecal apertures are two pairs, in grooves 7/8 and 8/9, close together near the middle line.

Internal Anatomy :—No septa are specially thickened, though 8/9 and in an even less degree 7/8 are slightly so.

The gizzard, in segment vi, is rudimentary.

A pair of calcareous glands are present in segment xiii as well-defined ovoid swellings in which the vascular channels run longitudinally. The intestine begins in xviii.

The last heart is in segment xii.

The arrangement of the anterior male organs was not quite clear. There are seminal vesicles in segments xi and xii,—large square masses filling out the segment, attached to the anterior septum of the segment, those of xi perhaps partly fused together in the middle line, those in xii contiguous only. In x there is a similar structure; in the specimen first dissected it was definitely noted to be a sac, not merely a compact mass of coagulum; the funnels appeared to be contained within them, so that they would be testis sacs. In another specimen (in which however, as noted below, the male organs had an abnormal position) there were no sacs in the corresponding segment,—only a cleanly detachable mass of coagulum; and the funnels were free in this and the next segment.

The prostates are compact cubical masses in segment xviii, the septa of which are not bulged backwards or forwards. The short and moderately stout duct passes transversely inwards from the hilus.

The ampullae of the spermathecae have a peculiar shape; the anterior border is deeply indented, so as to form two or three rounded lobules (fig. 20), the lowest of which may simulate a diverticulum. The duct is thick, short, and not definitely marked off from the ampulla. What I take to be the real diverticula are a few small rounded knobs at the ental end of the duct, which apparently are not always present.

The penial setae (fig. 21) are ·5 mm. long, and 11μ thick at the middle. The shaft is straight with a slight curvature at the distal end, and tapers rather rapidly. The tip however is cut off squarely, and carries five or six fine spines. There are also six circles of fine spines on the curved distal portion of the shaft, just above the tip.

The abnormal specimen mentioned above had the genital organs two segments further forwards than the normal. Thus the male pores were on xvi, the posterior seminal vesicles in x (extending back however as far as xii), the anterior vesicles in ix, the spermathecae in vi and vii. The male funnels were free in segments viii and ix.

Remarks:—The nearest relative of the present species is *P. parvulus* (Stephenson, **12**), from near Ghoom in the E. Himalayas; but the penial setae and form of the spermathecae prevent the union of the two. These two, with *P. excavatus*, *P. fulvus*, and perhaps *P. bainii*, seem to form a closely allied natural group.

Perionyx pullus, sp. nov.

Plate X, fig. 22.

Belgaum, Bombay Pres 4-vi-1917. T. R Bell. A single specimen, the posterior end broken off.

External Characters:—Length of the fragment 62 mm.; diameter max. 3·5 mm. Colour dark grey on both surfaces, scarcely any difference between dorsal and ventral. Segments present 165. Ventral surface concave except at anterior end, thus presenting a longitudinal groove bordered by prominent ventro-lateral ridges.

Prostomium epilobous $\frac{3}{4}$, the tongue being triangular; from its backwardly directed point a groove is continued in the middle line back to the clitellum.

Dorsal pores begin in groove 1/2; this must be about the extreme anterior limit which they ever attain, though I could not say that it is unique. Beddard (**1**) states that dorsal pores are never found on the first one or two segments of the body.

The setal rings are interrupted dorsally; in front of the clitellum $zz=3yz$, and behind=about $2yz$; but behind the clitellum the interval itself, as well as the intersetal intervals on each side, is irregular. The ventral break is absent, or small and irregular. On the ventral surface the setae are small and very close together,—almost as close as they can be. For this reason, and also because of the dark colour of the animal, they are very difficult to count; behind the clitellum there are about 60, and further back 64.

The clitellum is extensive, from xi to xx (=10); it is slightly swollen, less marked or absent ventrally, rather darker in colour, and dorsal pores are absent.

The male field is situated on segment xix (whether normally, or exceptionally in this particular specimen, cannot be said). It consists of a mid-ventral rectangular area, rather broader than long, which takes up most of the length of the segment; it is delimited at the sides by slight grooves and in front and behind by deep trenches, which coincide with the intersegmental furrows; the trenches are however much broader than the intersegmental furrows, and encroach anteriorly and posteriorly on the surface of the segment. The pores are apparently on two small whitish papillae very close together near the midventral line.

The female pore was not visible.

The spermathecal apertures are two pairs, in grooves 7/8 and 8/9, close to the middle line.

Internal Anatomy :—No septa are specially thickened.

There is no gizzard, even vestigial. The pharyngeal glands are especially bulky, and extend as large masses on the alimentary canal backwards to segment ix. The oesophagus is bulged laterally, and its walls are vascular, in segments x-xiii. The intestine begins in xvii.

The last heart is in segment xii.

The nephridia end in approximately the same line.

The male funnels (presumably testes also) are free in segments x and xi.

Seminal vesicles occupy segments xi, xii, and xiii. They are relatively small, are attached to the anterior wall of their segment in each case, and have a racemose appearance owing to their being composed of a number of small lobules; indeed the extremely racemose appearance of those in segment xiii caused them momentarily to be mistaken for ovaries. There appeared to be an additional minute pair of racemose vesicles in xiv also.

The prostates, in segment xix, are small, and consist of a number of elongated finger-like lobes, the whole forming a bushy cluster. The duct is small, soft, not much thickened, and runs transversely inwards.

Ovarian funnels were identified in xiii.

The spermathecae (fig. 22) are situated in segments viii and ix. The ampulla is

very irregular in shape, and narrows below to become the duct without any distinct delimitation. If the beginning of the duct is taken to be just below the diverticula, it is about as long as the ampulla; it narrows gradually towards its ectal end. The diverticula, about three in number, are small rounded sessile chambers, situated at what may be considered as the lower part of the ampulla.

There are no penial setae.

Perionyx minimus, sp. nov.

Plate X, fig. 23.

Belgaum, Bombay Pres. 4-vi-1917. T. R. Bell. Numerous specimens.

External Characters:—The worms are very small; a long one measures 45 mm. in length, while the thickness is only 1 mm., or as a maximum $1\frac{1}{4}$ mm. The colour is a medium brown dorsally, and a rather lighter brown ventrally. Segments 100. The ventral surface is flattened.

Prostomium epilobous $\frac{1}{2}$ or nearly so, tongue cut off behind; both prostomium and first segment divided in the mid-dorsal line by a longitudinal groove.

Dorsal pores from 4/5; or a rudimentary pore in 4/5, and the first well developed pore in 5/6.

The setal rings are almost closed ventrally; the dorsal interval is well marked, $=2yz$. The setae are much closer set ventrally than dorsally. On the twentieth segment there are about 26 setae, in the middle of the body about 36.

The clitellum extends from the middle, or perhaps the anterior end, of xiii backwards to include segment xvii ($=4\frac{1}{2}$ or 5); it is rather narrowed, of a somewhat darker colour, and the separate segments are easily distinguishable.

The male pores are on conspicuous round papillae on xviii. The area between these papillae is depressed, the depression extending longitudinally from the middle of xvii to the anterior third of xix; this area is encroached on laterally by the papillae, so that the depression has a dumbbell shape, the dumbbell being placed longitudinally; the apertures look somewhat inwards.

The female pore (or pores) are situated in a transverse groove anteriorly on segment xiv.

The spermathecal pores were not distinctly seen, but appeared to be about a quarter of the circumference apart, in grooves 7/8 and 8/9.

Internal Anatomy:—No septa are thickened.

There is apparently a rudimentary gizzard in segment v. The oesophagus is slightly bulged in segments xiii and xiv, with longitudinal vascular striations. The intestine begins behind the prostates, in segment xix. The "pharyngeal glands" extend back to segment vii as definite lobes on each side filling out the segments.

The last heart is in segment xii.

Relatively large seminal funnels are present in segments x and xi, embedded in a mass of very adherent flocculent matter simulating seminal vesicles; the testes were not separately identified.

Seminal vesicles are present in segments ix and xii; both pairs are brown in

colour. Those in xii are large and lobulated, and meet but do not fuse with each other dorsally; the vesicle on the right side in segment ix was moderately large, but that on the left was small (? had been in part detached and washed away).

The prostates occupy more than one segment,—xviii and part of xvii on the right side, xviii and part of xix on the left; they are somewhat loosely lobulated. The duct is short, narrow and rather soft; it is covered over by the lobules of the gland, and is not visible till these are separated.

The ovaries, relatively very large, and funnels are in segment xiii. In segment xiv are conspicuous ovisacs, containing large ova.

The spermathecae are of moderate size, in segments viii and ix. The ampulla is rounded, and rather flattened between successive septa. The duct is of about the same length as the ampulla; at its ental end, between the two diverticula, it is rather narrow, but becomes thicker below them (fig. 23). The diverticula are small, subspherical, and attached to the ental end of the duct by short stalks; they have rather a cauliflower-like appearance, but this is not due to any lobulation,—it seems to be occasioned by wisps of iridescent spermatozoa shining through the wall.

There are no penial setae.

Perionyx igatpuriensis, sp. nov.

Plate X, fig. 24.

Igatpuri, Bombay Pres. 29-vi-1917 B. Prashad. Three specimens, one consisting of only the anterior end.

Elephanta Island, Bombay; on the sea-shore. 30-vi-1917. B. Prashad. Three specimens.

External Characters:—Length 40–52 mm.; diameter 2-2·5 mm. Colour dark, purple dorsally, pale ventrally; clitellum slightly lighter dorsally than the rest of the dorsal surface. Segments 150–170.

Prostomium epilobous $\frac{1}{2}$, tongue broad, cut off behind.

Dorsal pores begin from groove 4/5.

The setal rings are unbroken dorsally; the ventral break is small and irregular, or altogether absent. The setae are closer set ventrally than dorsally. The following numbers were counted:—v/36, ix/48, xii/46, xix/41, and in the middle of the body 44 (in the specimen examined from the Bombay material the numbers were somewhat greater in the anterior segments).

The clitellum extends over xiii–xvii (only to xvi in Bombay specimen) (=4 or 5); setae are present, and the intersegmental grooves can be distinguished.

The male pores appear as depressions, each in the middle of a small circular area with slightly raised lips, near the middle line in segment xviii; these areas are separated only by a groove in the mid-ventral line, and in length take up nearly the whole segment. Black dots, which may be seen in the depressions, are the penial setae.

The female pore is represented by a whitish dot in a transversely oval depression anteriorly on segment xiv.

The spermathecal pores are two pairs, in grooves 7/8 and 8/9; they are conspicu-

ous round apertures near the middle line, the same distance apart as the male pores.

Internal Anatomy :—The first septum appears to be 5/6 ; all are present, and all are thin.

The gizzard, in segment vi, was soft and rather small in the original specimen from Igatpuri; in the specimen from Bombay however it was of large size, but soft and yielding easily to pressure with a needle ; in shape it was rather cylindrical, but somewhat narrower posteriorly.

There are no calciferous glands ; the gut may be bulged laterally in segments xiii and xiv. The intestine begins in xxiii.

The last heart is in xiii.

The endings of the nephridia are in the same line.

Testes and funnels are free in segments x and xi ; these segments are full of flocculent material (developing spermatozoa).

Seminal vesicles occupy segments xi and xii ; they are large paired sacs, not fused in the middle line. They are rounded in form, their borders not indented or lobed (in the Bombay specimen they appeared somewhat granular, as if made up of minute lobules). Those in xii are the larger, pressing back septum 12/13.

The prostates are compact masses occupying segment xviii, the limiting septa of which are much bulged apart by their bulk ; each consists of an anterior and posterior lobe, from between which the duct issues. The duct is short, straight, and narrow, and passes transversely inwards.

The large ovaries and the funnels are in segment xiii.

The spermathecae, in segments viii and ix, present an elongated ovoid or irregular ampulla with a short stout duct, a third or a quarter as long and a third as wide as the ampulla. There is a single diverticulum, attached to the base of the ampulla, sessile, cauliflower-like and consisting of a number of small seminal chambers ; in extent it is one-third or a quarter as long as the ampulla, against the lower part of which it may be flattened (fig. 24).

The penial setae are ·44-·52 mm. long, and 15μ thick in the middle. The shaft is almost straight, very slightly bowed,—more so at the distal end ; the tip is simply and rather bluntly pointed; there are about six rings of rather small spines near the tip. (In the Bombay specimen the setae were a little larger,—·68 mm. long, and 20μ thick, with seven well-marked rings of small spines, and two or three rings only very faintly indicated proximal to these).

Remarks :—The present species resembles *P. millardi*,—very closely in many respects. The distinctive difference is in the spermathecae, which there have no diverticulum. Minor differences are the setal rings,—the breaks dorsally and ventrally being smaller or mostly absent here ; and perhaps the penial setae, which have fewer rings of spines in the present species.

Perionyx spp.

In the various collections examined there were a number of specimens of this genus which could not be referred to any species on account of immaturity. Some

such were obtained from above Tura, in Assam; from the Western Ghats; from Pashok in the Darjiling District; from the Sitong Ridge, and from hill streams near Sitong, also in the Darjiling District. All these regions are already in the recognized area of distribution of the genus, and the specimens may be dismissed with a couple of remarks on their habits. Of a batch of specimens found above Tura, Mr. Kemp remarks, "This worm is found coiled up on the upper or under sides of leaves in dense jungle, forming a compact gelatinous mass. When touched it springs to life, performing somersaults and other acrobatic feats." The second noteworthy feature is the aquatic habitat of the worms from hill streams near Sitong; they were found living in water under stones.

Genus **Lampito**.

Lampito mauritii, Kinb.

This worm is one of the commonest in India,—absolutely the commonest in the present collections; and being so widely distributed it is scarcely necessary for the future to note the precise details of each capture.

The following are the localities from which I have received it:—In the Central Provinces and Central India, from Nemar Kheri on the way to Indore, Katni, Gwalior and Jubbulpore; in S. Rajputana, from Dungarpur and Banswara; and in the Bombay Presidency from Bombay (where it is very common), Broach, Surat, Ahmedabad, Nadiad, Dhanu, Sirvai Madhopur, Baroda, Palchar, and Joshachivir on the way to Mahableshwar.

Genus **Pheretima**.

Pheretima posthuma (L. Vaill.).

Also extremely common; from Khulna and Dattapakur in Bengal; Udaipur in Rajputana; Gwalior in Central India; Bindra Ban, near Muttra, United Provinces; and Baroda in the Bombay Presidency.

Pheretima hawayana (Rosa).

A common Indian worm; from Bindra Ban, Udaipur, and Bombay.

Pheretima heterochaeta (Mchlsn.).

Common in India; from Sureil, 5,000 ft. in Darjiling District. An immature specimen, probably of this species, from Pashok, 3,500 ft., also in Darjiling District.

Pheretima elongata (E. Perrier).

Manmad, Bombay Pres. 28-vi-1917. B. Prashad. Several specimens.

Palia, between Indore and Ujjain. Central India. 27-vi-1917. B. Prashad One specimen, a mutilated anterior end.

Indore, Central India. 23-vi-1917. B. Prashad. Three specimens.

Indore, banks of River Kan. 25-vi-1917. B. Prashad. Several specimens, immature, but probably of this species.

Ujjain, Central India. 26-vi-1917. B. Prashad. Several specimens, with others, probably of the same species, but immature.

Namkana, Sunderbans, Bengal ; near the banks of a reclaimed island. 10-xi-1918. B. Prashad. Several specimens.

Calcutta. Nov. 1913. E. C. Dormieux. A single specimen.

The length of the specimens from Manmad (the only ones subjected to a complete examination) varied; a long one was as much as 230 mm.

Large testis sacs, enclosing alimentary canal, hearts, and dorsal vessel, as well as the testes and funnels, were present in segments x and xi; and seminal vesicles in xi, xii and xiii, as noted by previous observers. The seminal vesicles of xi are contained within the testis sac of that segment; those of xii are large, and meet mid-dorsally; those of xiii are small and rounded.

It may be noted that the last heart was in segment xii, in the specimen dissected. I found no spermathecae (this condition has previously been noted in the species).

Remarks:—This worm has not hitherto passed for common in India. It was recorded from three localities by Michaelsen (**3**) as a result of his examination of the extensive collection of the Indian Museum,—from Hyderabad, Deccan; Kandy in Ceylon; and Karachi in Sind. I had not myself met with it previously. Like others of the genus, the present species has a wide distribution outside India—indeed it might be called a "world-wanderer."

The worm has generally gone under the name of *P. biserialis*; Michaelsen was able, by an examination of the types of *P. elongata*, to establish its identity with the latter (**4**).

Pheretima lignicola, Stephenson.

Bombay. June, 1915. N. B. Kinnear. Several specimens, not all mature.

Bombay. 7-xi-1914. N. B. Kinnear A number of specimens.

The colour appears to be variable; olive-green and brown have been noted in previous specimens; these,—the first of the two batches at least,—were a metallic bluish purple dorsally, and pinkish ventrally.

The setae of segments ii-ix were larger than those on the rest of the body. The intestinal caeca were crenulated on their dorsal margin.

Subfam. *OCTOCHAETINAE.*

Genus **Hoplochaetella.**

Hoplochaetella anomala, sp. nov.

Plate X, figs. 25–29.

Belgaum, Bombay Pres. 5-vi-1910. N. B. Kinnear. Eight specimens, and a fragment consisting of the posterior end. In bad condition.

External Characters:—Length about 85 mm.; diameter 3 mm. The worms are apparently unpigmented or almost so; in their present condition, with much thinned body-walls, the colour is given by the intestinal contents. Segments ca. 105.

Prostomium epilobous $\frac{1}{3}$, tongue broad, sides slightly converging behind, not cut off by a transverse furrow.

Dorsal pores begin from 4/5.

The setal rings are almost closed ventrally; $aa = 1\frac{1}{2}$-$2ab$. The dorsal break is about $4yz$ in front of the clitellum, $3yz$ behind it, and $2yz$ in the middle of the body. The setal intervals decrease somewhat outwards from the middle line, so that $aa > ab > bc > cd$. The numbers of setae are difficult to ascertain, since the worms will bear scarcely any manipulation, and doubtless many setae have dropped out; I could only count the intervals between the muscle bundles:—viii/36–44, xii/40–46, and in the middle of the body 40.

The clitellum extends from $\frac{1}{2}$xiii to $\frac{1}{2}$xvi (=3); it is smooth, brownish, swollen and well defined; setae are present, but no intersegmental furrows.

The male area (fig. 25) presents two pairs of well-marked depressions, crater-like, with thickened and rounded margins, on segments xvii and xix; these are rather oval in a transverse direction. The lip is less definite on the inner side, where it merges into a mid-ventral thickened area between the two depressions of a pair. The depressions extend transversely between the lines of setae *b* and *h*, and with their lips and the median thickened area take up the whole transverse extent of the ventral surface; longitudinally also they occupy the whole of the length of their respective segments, without however encroaching on segment xviii.

The male apertures are in the inner portions of the excavations, between the lines of setae *c* and *d*.

The female aperture is single, in a small circular whitish area just in front of the setal zone of segment xiv.

The spermathecal apertures are two pairs, on small papillae on segments viii and ix; they are in line with seta *c*, and about one-fifth of the circumference apart. In segment ix the papillae are in the setal zone, in viii in front of it.

The above description is that of the specimen of which a complete examination, internal and external, was made. In some of the other specimens there were a few variations in the external genital marks which deserve mention.

In one, there was a cup-shaped shallow depression, also with a thickened rounded margin, on the left side of segment xviii; this was rather smaller than those on xvii and xix, much shallower, and slightly internal in position to them. In another, there were depressions on both sides of xviii. Or the depressions containing the male pores may be smaller than above described, and circular in shape, not extending so far outwards; or the depressions may be reduced by the filling up of their outer part, the lip being much thickened here, almost like a papilla to the outer side of the pit.

A displacement of the setal line in the spermathecal region has been noticed in other species of the genus. This was not the case in the specimen first examined, though setae *cde* appeared to be absent on both sides of segments viii and ix. In another, *cdef* were displaced forwards on both sides in segment viii; *cd* were displaced backwards on the right side in ix, while on the left side the setal line was irregular.

Internal Anatomy:—The septa were all softened; they are apparently distinguishable as far forwards as 3/4, and 11/12 and 12/13 are perhaps somewhat thickened.

The gizzard is of large size, regularly ovoid, firm, in segment vii. The calcifer-

ous glands are in segments x–xiii, small, ovoid, set off from the alimentary canal; in segments x and xi they are within the testis sacs. The intestine begins in xvi.

The last heart is in segment xii. There is no large transverse vessel in xiii, but anteriorly in xiv a pair of stout vessels are given off from the dorsal vessel,—these may however only go to the alimentary canal.

In the first nineteen segments only micronephridia are present; some of these are scattered, and others form large tufts anteriorly by the side of the pharynx. Meganephridia begin from segment xx; probably micronephridia coexist, but have become unrecognizable.

Testis sacs are present in segments x and xi as large chambers which enclose the dorsal vessel and alimentary canal as well as the testes and funnels; those of segment x enclose in addition a pair of seminal vesicles.

The seminal vesicles are in segments ix, x, and xii; those in x, within the testis sacs, are attached to the posterior wall of the segment; those in ix and xii are large, and only slightly indented into lobes.

The prostates are two pairs of coiled tubes. The anterior occupy segments xvii and xviii, the posterior segments xix to xxi. The duct is in each case stouter than the gland, shining, straight and rather short, thinner at its ental end; each passes obliquely forwards and inwards. The ends of both pairs of ducts are surrounded by a soft white cushion on the inner face of the body-wall.

The vasa deferentia are two on each side, and pass backwards side by side beyond the termination of the anterior prostatic duct (fig. 26); shortly behind this, the outer duct of the two doubles back, after crossing underneath the inner, and ends immediately behind the termination of the anterior prostatic duct; the other vas deferens goes on, and ends immediately in front of the termination of the posterior prostatic duct.

The ovaries are in segment xiii; there are small ovisacs in xiv.

There are two pairs of spermathecae; the ampulla is a sac of very irregular form (fig. 27),—in some cases a portion is almost constricted off. The duct is stout, nearly as long as the ampulla, dilated and not shiny in its ental part, narrower and shining below; at its thickest part it is half as broad as the ampulla; it is separated from the sac above it by a constriction. The diverticula are two, opposite each other, attached to the duct immediately below the dilated part; each consists of a few rounded seminal chambers, the whole being sessile on the duct. The endings of the ducts, as seen on the inner side of the body-wall, correspond in position to the papillae seen externally.

As in other species, there are a number of accessory glands. These are clusters of finger-shaped structures, three to five in each cluster, of various lengths, the longest about equal to the duct of the spermatheca or rather longer. Each cluster ends near the termination of a spermathecal duct. The accessory glands themselves are solid, but have a distinct and fairly long duct with a lumen, and they are connected, where they pierce the body-wall, with the modified copulatory setae of segments viii and ix; fig. 28 is a rough sketch of gland and seta extracted together.

These copulatory setae are in length ·61 mm., and in thickness at the middle 22μ; they are almost straight, with a slight curve at the proximal end, tapering and bluntly pointed distally. There is scarcely any ornamentation,—only a few very fine oblique lines, or semicircular markings convex proximally, near the tip (fig. 29).

There are no penial setae in the segments of the male apertures.

Remarks:—The above interesting form has obvious relations with those I have previously described (**13**) under the name *Hoplochaetella*; it has, besides the same arrangement of prostates and spermathecae, the same displaced and modified setae in the neighbourhood of the spermathecal apertures, the same distribution of calciferous glands, and the same peculiar nephridial system. It does not however agree in all points with the emended definition of the genus which I gave.

Of the points of difference, one of the most interesting is the manner of ending of the vasa deferentia; in the other species of the genus the vasa deferentia unite, and then open in common with the anterior prostate on the seventeenth segment, while here the vasa are separate, and open, one with the anterior prostate on segment xvii, and the other with the posterior on xix.

In the Megascolecidae, what may be described as an attraction between the terminal portions of the genital organs is of very general occurrence. The primitive condition in the family is that known as the "original Acanthodriline," where the prostates end on segments xvii and xix, the vasa deferentia (after joining together) on xviii, and the spermathecae in furrows 7/8 and 8/9. In the Megascolecinae, one pair of prostates has disappeared, and the other has been "attracted" to join the termination of the vasa deferentia in xviii, an intermediate stage being seen in the genus *Diplotrema*. In the other species of *Hoplochaetella*, and in *Erythraeodrilus*, the conjoined vasa deferentia have been attracted forwards (to continue the same figure) to join the anterior prostatic duct on xvii. In the other species of *Hoplochaetella* also, the two pairs of prostates are approaching each other, and the two pairs of spermathecae show the same tendency. The very frequent union of the original pair of female pores on segment xiv is perhaps to be referred to the same group of phenomena. In *Eutyphoeus* (Octochaetinae) the single vas deferens on each side ends in common with the prostatic duct on xvii. Similar instances can be quoted from the Ocnerodrilinae.

In the present form, the attraction has taken a different course; the two vasa deferentia of each side have been as it were pulled apart, one towards the anterior, the other towards the posterior prostate, while these maintain their original position on the middle of segments xvii and xix.

In regard to the above point of difference, neither the present nor the former species of *Hoplochaetella* can be said to be primitive as compared with the other; evolution has merely taken a different course in the two. In certain features however the present form appears to show a more primitive condition than the species previously described. Thus the two pairs of spermathecal apertures, which in the other species are both on segment viii, are here more widely separated, on segments

viii and ix respectively. So too the prostatic apertures are in previous species posteriorly on xvii and anteriorly on xix, or actually in the furrows 17/18 and 18/19; while here they maintain their original position at the middle of xvii and xix.

Lastly, the testes and funnels are free in segments x and xi in the former species but are contained in testis sacs in the present form. Here I am not clear as to which is the more primitive condition. As a rule, of course, the free condition is to be looked on as primitive, and that in which the testes and funnels are enclosed in sacs, —separated-off portions of the coelom,—as secondary. But in the previous species of the genus the testes and funnels are not free in the usual sense; segments x and xi are very narrow, and septa 9/10, 10/11, and 11/12 are fused together at their periphery so as, at first, to give the impression of one enormously thickened septum. What has happened is that these septa have become approximated, and the contained segments very much contracted; whether originally, before the contraction took place, they contained testis sacs cannot now be decided,—the sac-walls (if the sac originally, as in the present form and often elsewhere, contained alimentary canal, hearts and dorsal vessel) may have simply fused with the walls of the segment.

I have previously (**13**) shown that *Hoplochaetella* is to be regarded as the ancestor of *Erythraeodrilus*. In some ways the present form may represent that ancestor more closely than any of the previous species; thus the condition as regards testis sacs is the same in this form and in *Erythraeodrilus*, and similarly with regard to the number and position of the seminal vesicles (three pairs in this form and in *Erythraeodrilus*, in segments ix, x, and xii; two, in ix and xii, in the other species of *Hoplochaetella*). The distinctive difference between *Hoplochaetella* and *Erythraeodrilus* is the presence of two pairs of prostates in the first, of one pair only in the second; in this, the present form agrees with *Hoplochaetella*, along with which I propose to include it, widening the previously given definition of the genus (as regards the endings of the vasa deferentia, the positions of the prostatic and spermathecal apertures, and the free testes and funnels) for the purpose.

Hoplochaetella spp.

Daman Road, N. of Bombay (between Bombay and Surat). 7-vii-1917. B. Prashad. Five specimens, none sexually mature.

Bombay, Malabar Hill. 1-vii-1917. B. Prashad. Numerous specimens, none mature.

Bombay, Elephanta Island, high up on a hill. 30-vi-1917. B. Prashad. Numerous specimens, none mature.

In the specimens from Malabar Hill the spermathecae could be seen on dissection to be just forming; they appeared to end in the furrows 7/8 and 8/9; if so, the approximation of the two pairs has not gone so far as in the majority of the species, where both pairs are on segment viii.

The specimens from Daman Road presented one point of interest to me. The type of the genus *Hoplochaetella* is Bourne's *Perichaeta stuarti*; and in identifying my former five species as belonging to this genus (**13**), one point which came up for discussion was that Bourne described certain diverticula of the intestine which I did

not find in any of my specimens ;—"In somites xxiii–xxvi (?) there are four pairs of special diverticula on the dorso-lateral portions of the intestine." In the example of the Daman Road batch which I dissected I noted that the segmental swellings and intersegmental constrictions of the intestine were very marked dorso-laterally in its anterior part ; and from about segment xxiii onwards for ten or a dozen segments there were very distinct lateral (not however dorso-lateral) sacculi, but their extent was rather indefinite. I did not, in my previous paper, consider the feature as of generic significance ; still it is perhaps some slight confirmation of my identification to find something similar (though not quite identical) in a worm which certainly belongs to the same group as those I there described.

Genus **Octochaetus.**

Octochaetus barkudensis, Stephenson.

Barkuda Island, Chilka Lake, Ganjam Dist., Madras Pres. ; at base of tree. 25-vii-1917 to 4-viii-1917. N. Annandale. Four specimens.

Same locality, date, and collector. Under stones on shore of island. One larger and a number of smaller specimens.

The papillae on segment viii may be joined in the middle line, and so appear as a dumbbell-shaped thickening.

In addition to the median oval papilla on segment xxii there may be a similar one on xxi.

Octochaetus fermori, Mchlsn.

Dhanu, a little distance N. of Bombay. 7-vii-1917. B. Prashad. Several specimens, immature.

Surat, W. India. 8-vii-1917. B. Prashad. Several specimens.

Ahmedabad, W. India. 11-vii-1917. B. Prashad. Several specimens.

Baroda, W. India ; by the banks of a tank. 9-vii-1917. B. Prashad. A single specimen.

Same place ; on a small hillock. 10-vii-1917. B. Prashad. One specimen, with perhaps two others, immature.

Gwalior, Central India ; bank of a stream. 17-vi-1917. B. Prashad. Five specimens.

Same place ; under flower-pots. 17-vi-1917. B. Prashad. A single specimen, rather immature.

Octochaetus paliensis, sp. nov.

Plate X, figs. 30-33.

Palia, between Indore and Ujjain, Central India. 27-vi-1917. B. Prashad. A single specimen, not in good condition.

Indore, Central India. 23-vi-1917. B. Prashad. Several specimens.

Poona. 3-vii-1917. B. Prashad. Two specimens, one smaller, not fully mature.

Bina, Central Provinces. 19-vi-1917. B. Prashad. A single specimen.

The description which follows is of the specimen from Palia, the one which was first examined. A few differences in the Poona specimens and in the one from Bina will be mentioned subsequently.

External Characters :—Length 45 mm. ; diameter 2·75 mm. Colour yellowish grey, not darker on the dorsal surface ; clitellum browner. Segments 141.

Prostomium apparently proepilobous (buccal cavity everted).

Dorsal pores from furrow 12/13.

Setae paired ; in front of the clitellum $ab = \frac{1}{3}aa$ = less than half (say $\frac{3}{7}$) $bc = \frac{2}{3}cd$; behind the clitellum $ab = \frac{2}{5}aa$ = half $bc = \frac{3}{4}cd$; in the middle of the body $ab = \frac{2}{5}aa = \frac{2}{3}bc$ and is slightly less than cd.

The clitellum extends over segments xiii-xvii (=5). Furrows are visible ventrally, but not dorsally ; dorsal pores are absent.

The male field shows two elongated trench-like depressions, on segments xvii and xix respectively ; these take up the whole length of the segments, and are thus separated by a transverse ridge which represents the ventral surface of xviii ; the trenches extend from a little outside the line of setae *b* to a corresponding point on the other side, and their lateral portions are rather deeper than the middle.

The prostatic pores are in these lateral portions, in line with setae *b*, on small white papillae. The seminal grooves pass longitudinally and straight between the pores of the same side.

The female pores could not be distinguished.

The whole of the ventral surfaces of segments viii and ix are thickened and somewhat flattened, forming a couple of low papillae, transversely much elongated, and with their lateral ends rounded ; these extend on each side to some distance outside the line of setae *b*. The spermathecal apertures appear to be just in front of the site of setae *a* of these segments, though setae *a* and *b* are not visible.

Internal Anatomy :—The first septum is probably 4/5 ; this is moderately thickened. Behind this is a space in which lies the gizzard ; the next septum is 7/8 ; this, and all the succeeding ones to 11/12 are somewhat thickened ; thereafter the thickening decreases as far as 14/15, after which all are thin.

The gizzard, in front of septum 7/8, is spherical, and not very hard. There is a pair of large calciferous glands in segment xv, on the right side getting also into xiv ; each is kidney-shaped, with its convex margin indented. The intestine begins in xvii.

The last heart is in segment xii.

The excretory system is micronephridial.

Male funnels are free in segments x and xi ; testes were only doubtfully identified.

The seminal vesicles are in segments ix and xii. In the latter segment they are small, somewhat flattened, and lie within the curve of the hearts on each side. In segment ix I found none on the right side ; but on the left there was a fairly large, very deeply indented and lobed vesicle.

The prostates are two pairs of opaque, moderately thick, convoluted tubes, in segments xvii and xix, which bulge apart the septa. The duct is thinner, shining, wavy in its course, transverse in direction, and thinner in its first part than afterwards.

The ovaries are in the usual situation.

The spermathecae are two pairs. The ampulla is elongated, somewhat conical, of moderate size ; the duct is half as wide and one-third as long as the ampulla, not

sharply marked off, and not shining. The diverticulum is single, club-shaped, without distinct stalk, and in length one-third or one-fourth of the whole main pouch (ampulla *plus* duct); it arises from the ectal end of the duct (fig. 30).

The penial setae are in length ·65-·76 mm., and their thickness at the middle is 16μ; the shaft is straight, the distal end slightly curved, and the tip bluntly pointed; the ornamentation consists of about eight circles of small spines near the tip (fig. 31*a*). A second shape also occurs, with a somewhat sinuous outline at the distal end, and more sharply pointed tip (fig. 31*b*); this is possibly due to such setae being younger, and not fully straightened out.

The copulatory setae of segments viii and ix are in length ·76-·82 mm., and 22μ thick in the middle. The proximal half is straight, the distal portion bowed; the tip is rather sharply pointed, and somewhat claw-shaped, with a slight swelling just proximal to the point. On the bowed distal portion of the shaft the convex and concave borders are furnished each with a row of spines, or incisions (fig. 32; in the example illustrated the spines stand off remarkably clearly; usually they are closely adpressed to the shaft).

In the specimen from Poona, the setal intervals were a little different:—in front of the genital region $ab = \frac{2}{5}aa =$ half $bc = \frac{3}{4}cd$; behind the clitellum $ab = \frac{1}{3}aa = \frac{3}{7}bc = \frac{3}{4}cd$; in the middle of the body $ab = \frac{2}{5}aa = \frac{4}{7}bc = \frac{4}{5}cd$; dd is approximately $\frac{4}{7}$ of the circumference.

The trenches on the male field of the previous example are here contained within a somewhat thickened area, which extends posteriorly to the middle of segment xx, where it becomes joined to a transversely much elongated papilla; this papilla covers the posterior half of xx and the anterior half of xxi, and transversely is of equal extent with the trenches in front.

There seemed to be a very thin septum in front of the gizzard, corresponding to 6/7; 5/6 seemed to be the only missing one. Small ovisacs were present in segment xiv.

The spermathecal ampulla here has the form of an ovoid sac; the duct is hardly distinguishable. The diverticulum is a rather cauliflower-like cluster of small seminal chambers, with a short stalk (fig. 33).

In some of the penial setae the tip, instead of being rounded, appears to have sharp lateral edges. On the copulatory setae also there seems to be a lateral, rather thick ridge on the claw-like tip; this was more or less distinct in the previous specimen also.

In the specimen from Bina, the prostomium might be said to be compounded of the prolobous and tanylobous types,—a tanylobous prostomium with a transverse furrow at the anterior end of the "tongue" cutting it off from the projecting lobe in front. The relations of the setal intervals are scarcely sufficiently different from the type to deserve mention. The seminal vesicles, in ix and xii, were fairly bulky, and their margins were only slightly lobulated.

The spermathecae were, as seen in dissection, of the simplest possible form,—elongated sacs, narrowing somewhat at their ectal end, without diverticulum. On microscopical examination however a diverticulum was seen, bound down to the main sac ; this was an ovoid simple appendage, showing no seminal chambers, entering the main sac rather nearer the ectal than the ental end ; it was a little narrower towards its attachment, but there was no stalk ; its length was a quarter, its thickness less than half, that of the main pouch.

The penial and copulatory setae were exactly those of the variety next to be described.

var. **riparius,** var. nov.

Plate X, figs. 34, 35.

Gwalior, Central India ; on the bank of a stream. 17-vi-1917. B. Prashad. Four specimens.
Same place ; in a garden. Same date and collector. Numerous specimens.
Same place ; under flower-pots. Same date and collector. Two specimens.

External Characters :—The largest specimen examined was 90 mm. long, and 3·5 in diameter. Colour buff or yellowish grey, no difference between dorsal and ventral surfaces ; the clitellum may have a reddish tinge. Segments 135.

Prostomium tanylobous or almost so ; furrows at the sides of the tongue parallel, but may be only slightly marked.

Dorsal pores begin at the hinder border of the clitellum.

The setae are paired. The relations may be expressed thus :—In front of the clitellum $ab = \frac{1}{3}aa = \frac{2}{5}bc = \frac{3}{4}cd$; behind the clitellum $= \frac{2}{7}aa = \frac{2}{5}bc = \frac{3}{4}cd$; in the middle of the body $= \frac{1}{3}aa = \frac{2}{5}bc = cd$; dd in the middle of the body is equal to $\frac{5}{9}$ of the circumference.

The clitellum extends over segments xiii-xvii ; it is thickened, well defined at both ends, the furrows obliterated but setae just indicated.

The male area is rather square, with thickened borders ; it includes segments xvii-xix and the anterior half of xx, extending transversely across the whole ventral surface. This area presents a dumbbell-shaped depression, expanded on segments xvii and xix, the narrowed handle of the dumbbell being on xviii (*i.e.* the dumbbell is placed longitudinally) ; the narrowing of the depression on xviii is caused by two large flat papillae, continuous at their outer margins with the thickened edge of the general male area (fig. 34).

The prostatic pores are in the line of setae *b*, in the broadened ends of the dumbbell ; the seminal grooves are convex inwards, skirting the inner border of the flat papillae.

The whole male field may be compared with that of the typical form by supposing that the lateral papillae of the present form have there extended mesially and joined, thus producing two separate depressions, one on xvii and one on xix (what I have called the " trenches "), with an intervening transverse ridge on xviii.

The female pores (or pore) are doubtless situated in a transversely oval area in front of the setal zone of segment xiv, which extends from a point between *a* and *b* on one side to a corresponding point on the other.

The ventral surfaces of segments viii and ix are thickened, as in the typical form ; these thickenings show each a pair of shallow depressions, approximately in the situation of the ventral pairs of setae (which however are not to be seen), and connected each with its fellow across the middle line by an irregular shallow trench. The spermathecal pores are in the depressed areas, rather in front of the middle of the segment, in the line of setae *a*, or between *a* and *b*.

Internal Anatomy :—Septum 4/5 is moderately thick ; the next is 7/8, which is somewhat thickened, as are all as far backwards as 13/14. The thickest of the series are 10/11 and 11/12 ; the thickening decreases by degrees in front and behind these ; there is some slight thickening even as far back as 16/17.

The gizzard is large and ovoid, occupying part of the space between septa 4/5 and 7/8. There is one pair of calciferous glands, in segment xv, with lobed outer margins. The intestine begins in xviii.

The last heart is in xii.

The micronephridia are small, numerous, and scattered irregularly.

Testes and funnels are free in segments x and xi ; these segments are filled out by masses of flocculent matter. The seminal vesicles, in ix and xii, are small.

The prostates are much coiled, in xvii and xix ; the relatively short duct is thinner than the glandular part, and passes inwards with an irregular bend at its beginning. A number of muscular bands, similar to those described by Michaelsen in *O. surensis* (**4**), are sufficiently prominent to attract attention.

The spermathecae are so exactly similar to those of the previously described specimen from Poona that no further account is necessary.

The penial setae, ·7 mm. long, 18μ thick in the middle and 20μ at the proximal end, resemble very closely the second shape found in the type form ; the number of rings of spines is about a dozen.

The copulatory setae are ·52 mm. long, and 20μ thick in the middle. They have the same bluntly pointed, slightly swollen and claw-shaped tip as the typical form. The convex and concave borders of the distal third of the shaft are furnished with thin serrated ridges (fig. 35), somewhat as if the spines of the typical form were bound to the shaft each by a delicate web. In addition, on the face of the seta which is presented to the observer under the microscope, a series of semicircular markings is seen ; but I am not quite clear what these actually represent.

In one, but only one, of the numerous specimens from the garden, an additional marking was present. This was a large slightly hollowed transverse papilla on the posterior half of segment xx and anterior half of xxi, extending from between *a* and *b* on one side to a corresponding point on the other, and joining the thickening of the male field along its anterior border (compare the specimen of the typical form from Poona).

Remarks :—The species is a very variable one,—in the characters of the prostomium, the external genital markings, the spermathecae, the penial and copulatory setae. Thus there are three well-marked kinds of spermathecal diverticulum,—simple

and attached to the ectal end, chambered and attached to the ectal end, and simple and attached (not merely attached but bound down by connective tissue) to near the middle of the sac. The variations are however so distributed that it is impossible to describe all the combinations as separate forms ; the one that I have named (var. *riparius*) is distinguishable on external examination by the marked difference in the male genital area.

Octochaetus prashadi, sp. nov.

Plate X, figs. 36-38.

Kalyan, near Bombay. 7-vii-1917. B. Prashad. A single specimen.

Sakarwari, on the way to Mahableshwar, W. Ghats. 4-vii-1917. B. Prashad. Two specimens.

External Characters :—Length 51-61 mm.; diameter 2·5-3·5 mm. Colour buff, no pigmentation, no difference between dorsal and ventral surfaces. Segments ca. 150; v and vi biannular, some or all of the rest up to the clitellum triannular.

Prostomium epilobous in varying degrees.

Dorsal pores from furrow 12/13 (there may be a rudimentary pore in 11/12).

There are some slight variations in the setal relations in the various specimens, but they are not very different from the following:—In the anterior part of the body $ab = \frac{2}{7}aa = \frac{2}{5}bc = \frac{3}{4}cd$, and the same behind the clitellum; in the middle of the body $ab = \frac{1}{3}aa =$ half $bc = \frac{3}{4}cd$. The dorsal interval $dd = \frac{4}{7}$ of the circumference.

The clitellum is absent, or very faint and indefinite.

The male field shows a quadrangular thickening which includes part of xvi and extends backwards to the hinder border of xx; laterally it reaches to the line of setae *c*. On segments xvii and xix are transverse trench-like depressions, deeper in their lateral portions, where the prostatic pores are situated on rounded papillae in line with setae *b*. The general aspect of the male area is thus not unlike that of the last species.

Here again is the same difficulty. One of the specimens from Sakarwari, though corresponding closely in all other points, and especially in the peculiar penial and copulatory setae, differs markedly from the other examples in the configuration of the male field. The thickening is less extensive; it does not get on to segment xx, and laterally does not reach the line *c*; there are no transverse depressions. Just possibly the difference is due to the animal not being sexually as advanced as the others.

The female pores are perhaps represented by a pair of small whitish dots near the middle line on segment xiv, and nearly at the middle of the length of the segment.

The ventral surfaces of segments viii and ix are thickened, especially, it may be, round the sites of setae *a* and *b*; these setae may not be visible, or they may be seen, rather closer together than usual and shifted forwards nearer the anterior border of the segment. The spermathecal apertures are in furrows 7/8 and 8/9, conspicuous, in line with setae *b*, or between *a* and *b*.

Internal Anatomy :—Septum 4/5 is somewhat thickened, 5/6 is thin, and 6/7 absent. There is then some thickening as far as the clitellar region, most marked, perhaps, in septa 9/10 and 10/11, and decreasing in front of and behind these.

The gizzard is in front of septum 7/8, relatively large, globular, but not very firm. There is a large calciferous gland on each side in xv, projecting backwards also into xvi; each is divided into an anterior and a posterior lobe, and on the whole is kidney-shaped; the posterior ends approach each other, and are at a higher level in the segment than the anterior. The intestine begins in xvii or xviii.

The last heart was in segment xiii twice, in xii once.

The micronephridia are numerous and small.

Testes and funnels are free in segments x and xi; the funnels are of large size, or at least the iridescent mass which adheres to them is. The seminal vesicles are in segments ix and xii; they are slightly lobulated; both pairs may be of moderate size, or those in ix may be much larger than the posterior pair.

The prostates, in segments xvii and xix, are relatively large, and bulge apart the septa of the containing segments. The glandular part is a rather thick and opaque tube, closely coiled; the duct is much thinner, shiny, passing inwards with a bend or loop at its origin, or with a wavy course.

Ovaries and funnels occupy the usual situation; there were in one specimen minute empty ovisacs in segment xiv.

The spermathecal sac has a very stout duct which is not sharply marked off; the diverticulum is of considerable relative size, and has a very thick stalk; it arises from the spermathecal duct where the latter enters the body wall (fig. 36). So much can be said of all three specimens; but all three differ in details. The ampulla may be irregular in shape, or simply ovoid; the diverticulum may be almost as long as the main sac, or considerably shorter; it may be quite simple, or it may be slightly lobed, and on microscopical examination a few small seminal chambers may be distinguishable.

The penial setae (fig. 37) are in length 1·5 mm., and 40μ thick in the middle; the tip is slightly hooked, and rather hollowed or spoon-like on its concave side. The ornamentation consists of a large number of close-set rings of fine spines, which extend nearly half way along the shaft.

The copulatory setae are ·8 mm. long, and 26μ thick at their middle. They are slightly bowed, and the tip is pointed; the distal portion of the shaft is marked by a number of scar-like depressions, with a general semicircular shape, and sharply defined, elevated and notched proximal margin (fig. 38).

Remarks:—In a number of details the present form remarkably resembles the last. The penial and copulatory setae however are very characteristic. There is no doubt however that this and the last are closely related species.

Octochaetus montanus, sp. nov.

Plate X, figs. 39, 40.

Panchgani, W. Ghats, 12 miles from Mahableshwar; alt. 4,000 ft. 5-vii-1917. B. Prashad. A single specimen.

External Characters:—Length 60 mm.; thickness 3·5 mm. Colour buff, non-pigmented, slightly blotchy in places. Segments 158.

Prostomium epilobous $\frac{1}{2}$, the tongue separated from the projecting lobe in front, but not delimited behind.

Dorsal pores begin from furrow 10/11.

The setal relations may be expressed as follows:—On segment vii $ab = \frac{2}{5}aa =$ half $bc = \frac{3}{5}cd$; behind the clitellum $ab = \frac{1}{3}aa = \frac{2}{5}bc =$ half cd; in the middle of the body $ab = \frac{1}{4}aa = \frac{3}{7}bc = \frac{4}{7}cd$; $dd =$ almost $\frac{2}{3}$ of the circumference.

The saddle-shaped clitellum takes up nearly eight segments, from near the anterior border of xii to xix inclusive.

The male field is a rectangular whitened area which includes the ventral surfaces of segments xvii-xix, and extends laterally to just outside the lines of setae *b*. The seminal grooves run longitudinally in line with setae *a*; the prostatic apertures, at the ends of the grooves, are not separately visible; the intersegmental furrows are visible, intersecting the seminal grooves at right angles.

An elongated, transversely oval genital papilla is present behind the male area, over the situation of furrow 21/22, depressed in its centre, where it covers the anterior half of xxii and the posterior of xxi; laterally it reaches on each side to the line of setae *b*.

Segment xiv presents a whitish pad mid-ventrally, on which the female pores are perhaps represented by a couple of darkish dots at about the middle of the length of the segment.

The spermathecal apertures seem to be in furrows 7/8 and 8/9, as a couple of whitish dots in line with *a*.

Internal Anatomy:—Septum 4/5 is moderately stout; 5/6 to 7/8 are very thin; 8/9 is somewhat thickened, 9/10 to 11/12 moderately so, 12/13 very slightly so.

The gizzard is in segment vi, of moderate size, squarish. The calciferous glands are two pairs, in segments xv and xvi, ovoid, antero-posteriorly compressed, and situated dorsally on the alimentary canal by the side of the dorsal vessel. The intestine begins in xvii.

The last heart is in xii.

The excretory system consists of scattered micronephridia.

Testes and funnels are free in segments x and xi. Two pairs of large seminal vesicles occupy ix and xii, those in xii meeting dorsally above the alimentary canal; both pairs are much lobulated,—indeed they might be described as racemose.

The prostates are two pairs, rather small. The glandular part is a rather thick opaque tube, with a few undulations but generally transverse in direction; the duct is very small, short and thin, also transverse in direction.

The large ovaries have the usual situation.

The spermathecal ampulla is an irregular sac; its duct is large, stout at its beginning and narrowing towards its ectal end, as long as the ampulla and fully half as thick in its ental portion. There is a single diverticulum, which arises from the duct at or above the middle of its length; it is finger-shaped on the whole, slightly swollen at its blind end, where a few seminal chambers are indistinctly seen (fig. 39).

The penial setae are in length up to 1·5 mm., but very thin,—only 6μ in thick-

ness at the middle. The shaft is rather bowed, and slightly undulating towards the tip; it tapers very gradually, and the tip is simply pointed; there is no ornamentation (fig. 40).

There are no copulatory setae in the spermathecal region.

Octochaetus pallidus, sp. nov.

Plate XI, figs. 41, 42.

Panchgani, W. Ghats, 12 miles from Mahableshwar; alt. 4,000 ft. 5-vii-1917. B. Prashad. Two specimens, one damaged in the clitellar region.

Mahableshwar, W. Ghats, 5,000 ft. 5-vii-1917. B. Prashad. A single mature specimen.

External Characters:—Length 40-44 mm.; diameter 2·5 mm. Colour pale yellowish, quite unpigmented, no difference between dorsal and ventral surfaces. Segments 166; segments vi-ix indistinctly triannular,—indeed this secondary annulation extends faintly as far back as the clitellum.

The prostomium differs in the two specimens from Panchgani; in the first it is prolobous, in the second somewhat epilobous, with a very broad angle behind, which is continued back by a median groove through segment i.

Dorsal pores from furrow 10/11; the first is small.

The setal relations may be expressed as follows:—In front of the spermathecae $ab = \frac{1}{3}\ aa$ = half $bc = \frac{2}{3}\ cd$; behind the genital segments $ab = \frac{1}{3}\ aa = \frac{1}{3}\ bc$ = half cd; at the middle of the body $ab = \frac{2}{5}\ aa$ = nearly half $bc = \frac{3}{5}\ cd$; dd is equal to half the circumference or rather less at the middle of the body, but at the hinder end is only about one-third of the circumference.

The clitellum is saddle-shaped, and extends over xiii-xvii (= 5).

The male field is represented in the undamaged Panchgani specimen by a thickening on the ventral surface of segments xvii-xix, which extends outwards to a little beyond the lines of setae *b*. The prostatic pores are in the line b, and the seminal grooves lie just outside this line, straight and longitudinal in direction, curving inwards at their extremities to end at the pores; the grooves are close to the edge of the whitish area.

In the specimen from Mahableshwar the field was rather more extensive, and circular in shape, it embraced portions of segments xvi and xx, and reached outwards to *c*. The prostatic pores were situated each in a small transverse groove.

The female pores are paired, on minute papillae a little internal to and in front of the site of setae *a*.

The spermathecal pores are two pairs, at the site of setae *a* on segments viii and ix; they are represented by small round papillae, white at their summits, but definite apertures were not present.

Internal Anatomy:—Septum 4/5 is thin, 5/6 and 6/7 very slightly strengthened, 7/8-11/12 all somewhat thickened, 12/13 only very slightly so; the rest are thin.

The gizzard is barrel-shaped, in segment vi; the oesophagus is distinctly strengthened in segment v also, where shining longitudinal muscular bands are seen. This seems to be the beginning of a double gizzard, such as is seen in *Eudichogaster*,

Dichogaster, and *Trigaster*; I do not however suggest at present that any of these genera are derived from this species, or indeed from the genus *Octochaetus* at all.

There are no calciferous glands. The intestine begins in xvi.

The last heart is in segment xii.

The excretory system is micronephridial. In the postclitellar segments the organs are few in each segment and of moderately large size; they are placed in a transverse row in each segment, about seven on each side, and in each row they increase in size from the ventral end of the row as far as the fifth nephridium, but the two most dorsal are smaller again. This was the condition in the anterior part of the animal,—in that part usually opened for dissection; on opening the posterior part of the specimen the difference in size was found to disappear towards the hinder end.

A curious modification of the nephridia, which I have not seen before, was found in segments xi and xii. In each of these segments a ventrally situated pair of structures attracted my attention; these appeared at first to be flattened bags, rather oval in shape, taking up approximately the whole length of the segment from one septum to the other, and attached by a stalk at their inner ends to the body-wall near the middle line. They could be detached from the body-wall except where they were attached by the stalk; there was nothing to correspond externally. They were present in the same segments and the same position in the second worm from Panchgani. Microscopically they were found to be masses of micronephridial tubules, arranged in a compact series of parallel loops, the loops running transversely to the long axis of the oval mass.

Testes and funnels were free in segments x and xi, along with much flocculent matter.

There are two pairs of seminal vesicles, in ix and xii. Both pairs are of moderate size; those in xii are racemose, those in ix have almost smooth borders.

The prostates are two pairs; they are tubular, of moderate size, the glandular part consisting of a series of apposed loops. The duct is very narrow at its beginning, but soon widens; it makes a complete bend, and then passes inwards and slightly forwards; it is of some length, straight after the initial bend, stout and shining.

The ovaries are in segment xiii; ovisacs are present in xiv.

The spermathecal ampulla is elongated, narrower towards its blind end, swollen near its base, of moderate size; the duct is quite short, and appears dilated, so as to be subglobular. The diverticulum is single, stalked, rounded, about equal in size to the duct, to the side of which it is attached; the diverticulum shines with contained spermatozoa, but is not chambered (fig. 41).

The penial setae (fig. 42) are ·79 mm. long, and 7 to 8μ thick at the middle. The shaft is slightly bowed, and tapers gradually towards the tip; the point is fairly sharp, and there is no ornamentation, but the distal end of the seta has a curious wavy outline.

Remarks :—The present form appears to be related both to the last (smooth penial setae), and also to the anomalous and somewhat problematical *O. bishambari*

which I described some time ago (**9**); in additional to having smooth penial setae the latter species has, like the present one, no calciferous glands.

Octochaetus ganeshae, sp. nov.

Plate XI, figs. 43-45.

Ganeshkhind, 4 miles from Poona. 3-vii-1917. B. Prashad. Three specimens.

Londa, 10 miles from Castle Rock, W. India. 6-vii-1917. B Prashad. One specimen, an anterior fragment, not fully mature.

External Characters :—Length 43 mm.; diameter 2·5 mm. Colour unpigmented, pale except where matter in the alimentary canal shows through the body-wall. Segments 150.

Prostomium epilobous to a somewhat varying extent, about $\frac{3}{4}$; sides of tongue parallel, or (once) converging behind to form a **Y**-shaped figure.

Segments v and vi biannular, thenceforwards as far as the clitellar region triannular.

Dorsal pores from furrow 12/13.

Setal ratios may be expressed as follows :—Behind the genital region $ab = \frac{1}{4}aa = \frac{2}{5}bc = \frac{3}{4}cd$; in the middle of the body $ab = \frac{1}{3}aa = \frac{2}{5}bc = \frac{3}{4}cd$; but apparently different specimens show slightly different ratios. In front of the genital region the setae are small and difficult to see. The mid-dorsal distance *dd* is almost two-thirds of the circumference.

The clitellum is absent, or not developed in these specimens.

The male field is a slightly raised whitish area,—more raised towards its lateral margins,—rectangular in shape, including segments xvii-xix and extending outwards on each side rather further than half way between the lines of setae *b* and *c*. The prostatic pores are between the lines of *a* and *b*, and the seminal grooves are almost straight, slightly bowed inwards.

The female pores are marked by a pair of minute indistinct papillae anteriorly on segment xiv and internal to the line *a*.

The spermathecal apertures are minute slits on segments viii and ix, just in front of and between the two setae of each ventral couple.

Internal Anatomy :—Septum 4/5 is moderately strengthened; 5/6 and 6/7 are absent, 7/8 and 8/9 are slightly thickened, 9/10 to 11/12 considerably so, 12/13, 13/14, and even 14/15 slightly so.

The gizzard is of moderate size, rounded, and situated in the space between septa 4/5 and 7/8; probably it is morphologically in vi, since there are soft-walled portions of the canal both in front of and behind it within these limits.

The calciferous glands, in the specimen from Ganeshkhind first examined, are in xv, of moderate size, confined to this segment, somewhat kidney-shaped, slightly lobed, attached to the gut by the hilus, and meeting dorsally over the gut. In the specimen from Londa the glands took up part of two segments, xv and xvi, and were mainly in the latter; they were deeply incised by the septum.

The intestine begins in xvii or xviii.

The last heart is in xii.

The micronephridia are arranged in a single transverse row in each segment.

Testes and funnels are large and free, in segments x and xi. Seminal vesicles occupy segments ix and xii; both pairs are of moderate size, and slightly lobed.

The tubular prostates consist of a few coils only. The duct is about half the thickness of the glandular portion, of the same diameter throughout, soft and semitransparent, passing with an undulating course transversely inwards.

The female organs have the usual situation.

The spermathecal ampulla is an elongated sac, narrower towards its blind end, almost sessile on the body-wall, so that a duct cannot be separately distinguished. There is a single diverticulum, which may appear simple, or may show a few small lobulations; it is small, and attached by a short stalk to the base of the ampulla where this joins the body-wall (fig. 43).

The penial setae (fig. 44) are ·42 mm. long (possibly longer when fully developed), and 10μ thick at the middle. The shaft is almost straight, slightly bowed towards the distal end; the tip is pointed and slightly hooked; the ornamentation consists of a few circles of fine spines near the tip, principally visible as fine irregularities of the edges of the seta.

The copulatory setae of the spermathecal segments are in length ·27 mm., but here also the full length may not have been attained; they are 10μ thick at the middle. They are not very different in type from the penial setae; the shaft is straight for the most part, slightly bowed towards the tip, which is bluntly pointed and somewhat claw-shaped. The ornamentation consists of a number of fine spines on the convex and concave borders of the terminal portion of the shaft; in the specimen from Londa a few incomplete rings were seen (fig. 45).

Octochaetus pachpaharensis, sp. now.

Plate XI, figs. 46, 47.

Pachpahar, about 40 miles S. of Kotah, Rajputana. 13-vii-1917. B. Prashad. Five specimens.

External Characters :—Length 28 mm., diameter 1 mm. Unpigmented. Segments 95.

Prostomium broad, slightly epilobous, tongue not cut off behind.

Dorsal pores from furrow 7/8.

Setal relations not easy to determine in such a small worm,—perhaps in general $ab = \frac{2}{7}\, aa = \frac{2}{5}\, bc = \frac{2}{3} cd$; dd is slightly less than half the circumference.

The clitellum extends over segments xiii — $\frac{2}{3}$ xviii ($= 4\frac{2}{3}$). It is saddle-shaped except on xiii or xiii and xiv, where it is complete.

The prostatic pores, and the straight seminal grooves, are between the lines a and b.

The female pores are apparently paired, on the anterior part of segment xiv.

The spermathecal apertures were not visible externally; on dissection they appeared to be in grooves 7/8 and 8/9.

Internal Anatomy :—Septum 5/6 is somewhat thickened, 6/7 considerably, 7/8, 8/9 and 9/10 much thickened, considering the size of the worm ; 10/11 to 13/14 are also somewhat strengthened.

There is a rudimentary gizzard in segment vi, of fair size, barrel-shaped, but soft ; it appears as shining longitudinal bundles of muscular fibres. The large lobes of the pharyngeal glands occupy much space in segment v. There are no calciferous glands. The intestine begins in xiv.

The last heart is in xii.

The excretory system is micronephridial. Behind the genital region there are three nephridia on each side in each segment, with the form of flattened coils (not the flattened plate-like organs of *Dichogaster*, where similarly there are only a few nephridia on each side in each segment). In front of the prostatic region there are even fewer, perhaps only one on each side in some segments (?).

Testes and funnels are free in segments x and xi (judged from the flocculent masses in these segments, which pass deep in the segments into the irideseent covering of the funnels ; testes were not separately identified). Seminal vesicles are present only in xii, as rounded masses which may meet dorsally over the alimentary canal.

The prostates are two pairs, tubular, of fair length and sometimes extending beyond their own segment, bent several times. The duct is much thinner than the glandular portion, almost straight, and shining.

Ovaries are present in segment xiii, and ovisacs in xiv.

The spermathecal ampulla is an exceedingly irregular and deeply lobed sac (fig. 46) ; the duct is as long as or longer than the ampulla, but relatively narrow, of the same diameter throughout, firm and shining. What I think is the diverticulum (since in one specimen it contained iridescent spermatozoa, which the main sac never does) is a saccule attached to the ental end of the duct, much resembling one of the lobes into which the ampulla is incised.

Two spermathecae were found on the right side in segment viii, opening side by side ; this is presumably an individual anomaly.

The penial setae are bent into about two-fifths of a circle, and measure across the bend ·7 mm. ; the thickness at the middle is 12μ, but at the proximal end 20μ. The shaft tapers gently towards the distal end, which does not quite continue the direction of the curve, but is slightly bent in the contrary direction. The tip is somewhat wavy, and ends in a fairly sharp point. The ornamentation consists of a number of irregular rings of small teeth on the distal portion of the shaft, the terminal portion however being smooth.

Remarks :—The absence of calciferous glands, with the small number of nephridia per segment, allies this form to the group of *pallidus* and *bishambari*.

Genus **Eutyphoeus**.

Eutyphoeus incommodus (Bedd).

Bharatpur, E. Rajputana. 15-vii-1917. B. Prashad. Two specimens.

Eutyphoeus mohammedi, Stephenson.

Rawal Pindi, N. Punjab. June-July 1917. R. Hodgart. A single specimen.

This worm has been recorded only once previously, from Allahabad (**9**). I add a few notes on the external characters of the present specimen; the internal anatomy corresponds exactly with that of the type.

The length of the present example was only 39 mm.; its maximum diameter, behind the clitellum, where it was perhaps unnaturally swollen, was 4·75 mm.; the worm is thus short and stout. Segments ca. 160, all very short behind the clitellum. The prostomium showed no projecting lobe,—perhaps this was withdrawn within the buccal cavity; a couple of parallel grooves on the dorsal surface of the first segment indicated that it was tanylobous.

The setal intervals were as follows:—$ab = \frac{1}{3}aa = \frac{2}{3}bc = \frac{3}{3}cd$; but in front of the clitellum the mid-ventral distance *aa* becomes much smaller.

The male pores were situated on distinct papillae.

Eutyphoeus chittagongianus, Mchlsn.

Above Tura, Garo Hills, Assam; 3,900 ft. On paths after rain. July-Aug. 1917. S. W. Kemp. Two specimens W $\frac{17}{1}$–, W $\frac{176}{1}$.

Above Tura, Garo Hills, Assam; 3,900 ft. July-Aug. 1917. S. W. Kemp. Two specimens W $\frac{167}{1}$, W $\frac{168}{1}$.

Sureil, Darjiling Dist.; 5,000 ft. 11-31-x-1917. N. Annandale and F. Gravely. A single specimen.

Nam Ting Pokri, Darjiling Dist.; 4,600 ft. June-July 1918. S. W. Kemp. A single specimen.

This worm has been described by Michaelsen (**3**) from two specimens in a bad state of preservation. I therefore add a few notes to supplement the original account.

External Characters:—The length is various, from 182 to 405 mm.; the maximum diameter is as much as 10 mm. The colour may be a medium olive dorsally, lighter below; or the worm may be almost unpigmented throughout.

Secondary annulation is well marked on the anterior segments; iv and v are biannular, vi has two chief and two subsidiary furrows, and succeeding segments as far as the clitellum are primarily triannular, with secondary furrows on the first and last annuli; the post-clitellar segments may also be triannular.

Setae seem to be sometimes absent on the first four or five segments.

The male pores, each sunk in a separate pit in Michaelsen's specimens, are often contained in a large transverse furrow which extends across the ventral surface; this furrow has rounded but not tumid lips, and on looking into it the male pores are seen on small transversely oval papillae in the line of setae *b*.

The spermathecal apertures, in *b* in Michaelsen's original specimens, and in some of mine, may be between *b* and *c*.

The genital markings, described in the original account as "intersegmental

areas," are seen in better preserved specimens to be clean-cut depressions, mainly on the posterior annulus of the anterior of the two segments with which they are in relation. These may occur also on furrow 10/11.

In some of my specimens there is a tendency for the post-genital depressions to divide into two (as in *E. kempi*; see below, *Remarks*); and low flat papillae may be present within some of the depressions.

Internal Anatomy:—The dorsal vessel, as in many species of the genus, does not extend forwards to the anterior end of the body; it gives off two pairs of lateral commissures in front of septum 8/9, and is not traceable beyond this,—it does not get on to the gizzard.

The micronephridia behind the genital region are arranged as a transverse row of small organs in each segment just behind the attachment of the septum; from the prostatic region forwards they are numerous and irregularly scattered.

Testis sacs, about which Michaelsen was in some little doubt, are present, large and subspherical, in xi, lying against septum 10/11; they are contiguous, and apparently communicate with each other, beneath the alimentary canal.

The spermathecal duct is practically absent, the ampulla being sessile on the body-wall and attached by a portion of its under surface; if a duct is described, it would be very short and stout. The broad fan-shaped diverticulum is often divided into two;—not always, and when undivided it may appear like a flange surrounding the greater part of the attachment of the ampulla to the body-wall. The number of seminal chambers appears to be about twenty.

The penial setae vary in length from 2 to 5 mm., and in thickness from 30 to 40μ; some of the difference in length may be due to the growth of the shorter not having been completed. The extent of distribution of the small teeth on the distal end varies. Even when fully formed setae were projecting from the male pores, the distal ends seemed to be often soft and perhaps deformed; Michaelsen had the same difficulty. The typical form of the tip seems to be broadened and perhaps spoon-shaped.

Remarks:—I have come to the conclusion that *E. kempi*, which I described from the Abor country (**8**), must be identified with the present form. The difference in form and distribution of the genital markings, and in the penial setae, are not sufficient to justify its separation, when one takes into consideration the variations that are now known to occur.

It might be justifiable to separate the specimens from Sureil and Nam Ting Pokri as a distinct variety, on account of (i) absence of pigment, (ii) spermathecal apertures midway between *b* and *c*, (iii) genital markings as pairs of oval depressions, those of a pair being contiguous in the middle line in furrows 19/20, 20/21, and 21/22, (iv) the tip of the penial setae free from ornamentation and smooth, while on the other hand, the minute spines extend further up the shaft than in the typical form. But the forms I previously described as *E. kempi* show an intermediate condition as regards (ii) and (iii), and in them too the tip of the penial setae is free from spines, though these do not extend far up the shaft.

Eutyphoeus waltoni, Mchlsn.

Delhi. 15-vii-1917. B. Prashad. Eight specimens.

Gwalior, Central India ; on the bank of a stream. 17-vi-1917. B. Prashad. Four specimens.

Ahmedabad, Bombay Pres. 11-vii-1917. B. Prashad. Numerous specimens.

Baroda, W. India. 9-vii-1917. On banks of Vishvamitri River. B. Prashad. Two specimens, one immature.

Same place ; in a garden. 9-vii-1917. B. Prashad. Several specimens, all or mostly immature.

Same place ; by the side of a tank. 9-vii-1917. B. Prashad. Four specimens.

Same place ; on a small hillock. 10-vii-1917. B. Prashad. Five specimens.

Same place ; in a garden. 10-vii-1917. B. Prashad. A number of specimens, mostly immature.

Navli, between Baroda and Ahmedabad. 10-vii-1917. B. Prashad. Four specimens, immature.

Calcutta ; banks of Hugli River, in partly saltish water. 23-viii-1918. B. Prashad. Four specimens, not fully mature.

The species is common in India, and is already well known. The present large number of specimens, of varying degrees of maturity, has led me to the conclusion that *E. bengalensis* Mchlsn. (**3**) has no separate existence, and is only an immature form of *E. waltoni.* In going over the above batches of specimens I had at first no suspicion of this, and diagnosed those from Delhi, Navli, and three of those from Baroda as *E. waltoni,* while I put down the worms from Gwalior, Ahmedabad, and two of the batches from Baroda as *E. bengalensis* ; I began to have doubts however during the progress of the work, and with regard to one of the batches from Baroda, of worms of varying degrees of maturity, I could feel no certainty. The Calcutta specimens I at first thought to be a new species. It seems to be the case that *E. waltoni* produces its penial setae early, and that these may be well developed before the clitellum and characteristic genital markings show themselves.

I may perhaps be allowed to discuss shortly the differences between the two species, according to Michaelsen's original descriptions (**3**).

E. waltoni would appear to be a much larger worm ; the lower limit of length for *E. waltoni,* however, is not very different from the length of Michaelsen's single specimen of *E. bengalensis* (*waltoni* 90-230 mm., *bengalensis* 72 mm.—by a misprint given as 12 mm.).

The prostomium of *waltoni* is tanylobous, of *bengalensis* prolobous. I have previously described the prostomium of *waltoni* as combined pro- and tanylobous,—tanylobous with a transverse groove in front of the tongue ; Michaelsen does not distinguish this form of prostomium from the typical tanylobous, without the transverse groove. In one of my specimens which I put down as *bengalensis* without hesitation, the prostomium was tanylobous.

As may be seen from a number of the species referred to in previous pages of this paper, small differences in the setal ratios are of no importance ; I may mention however that similarly in one of the present series of specimens, which I had no doubt about identifying as *bengalensis,* the ratios were exactly those given for *waltoni.*

Michaelsen does not mention the clitellum of *bengalensis*, and it was presumably absent. This I take to be a sign of immaturity. The same may be said of the absence of the genital markings.

The original account of *bengalensis* has "testes and sperm-duct-funnels free (?)"; my note on the specimens which I did not doubt, at the time, were *bengalensis* runs "I think sperm-sacs; the membrane is certainly very thin, but to the best of my observation it exists." *E. waltoni* has a common sperm-sac; so that there is probably no difference here.

One chief difference is that the penial setae of *waltoni* are beset with minute spines near the tip, while those of *bengalensis* are smooth (the shape is much the same). I have already noted (**9**) that I could not identify distinct spines even with the oil immersion lens in some specimens of *waltoni*; and in the present series, among those which are undoubtedly *waltoni*, I have twice found the spines absent from the spoonshaped tip, though a few were seen further up the shaft.

Lastly the spermathecal diverticula are said to be on opposite sides of the duct in *bengalensis*, side by side in *waltoni*; in some of the present series of *waltoni* however I have found them opposite each other.

Eutyphoeus turaensis, sp. nov.

Plate XI, figs. 48, 49.

Above Tura, Garo Hills, Assam; 3,500-3,900 ft.; in rotten wood. July-Aug. 1917. S. W. Kemp. Four specimens, one somewhat damaged. W $\frac{1\,8\,1}{1}$.

Same place, date, and collector. Under bark. Three specimens, immature. W $\frac{1\,7\,8}{1}$.

External Characters:—Length 100 mm.; maximum diameter 3·5 mm. Colour light grey, unpigmented; no difference between dorsal and ventral surfaces. Segments 171; segments long in front of, short behind the male apertures. Segments v and vi biannular or indistinctly triannular, vii triannular, viii and ix triannular with other secondary furrows also, x triannular, xi indistinctly so.

Prostomium small, tanylobous, tongue broader behind than in front.

Dorsal pores from furrow 11/12.

Setae are scarcely visible on segments ix and x, while they are enlarged on iii.-vi. The intervals may be expressed thus:—Anteriorly $ab = \frac{1}{3}aa$ = half $bc = \frac{3}{4}cd$; behind the clitellum $ab = \frac{1}{4}aa = \frac{2}{5}bc = \frac{2}{3}cd$; in the middle of the body $ab = \frac{1}{3}aa$ = half $bc = \frac{3}{4}cd$; dd is nearly equal to two-thirds of the circumference.

The clitellum is very slightly marked; all that is to be seen is some thickening ventrally on segments xv to xvii.

The male pores, on segment xvii, are in a pair of narrow transverse depressions which extend over an interval greater than ab, the limits of the depressions being inside the line a and outside b; penial setae, marking the site of the aperture, protrude in the line b.

The female apertures were not visible.

The spermathecal apertures are in furrow 7/8, in the line b.

Genital markings are faintly visible in furrows 14/15, 15/16, and 16/17, in line with *a*, as inconspicuous slightly pigmented spots surrounded by circular grooves.

Internal Anatomy :—Septa 4/5 and 5/6 are moderately stout; the next is 8/9, which is somewhat displaced backwards; this septum and the two following are rather close together, and are all somewhat strengthened; 11/12 is absent, as in *E. waltoni* and many others of the genus; 12/13 is very thin, and is bulged backwards to the level of 14/15 by the seminal vesicles; the rest are also thin.

The gizzard is barrel-shaped, situated in the long space between septa 5/6 and 8/9. Calciferous glands are represented by an ovoid dilatation of the alimentary canal in segment xii, with transverse vascular striations. The intestine begins in xv.

The last hearts are in xiii; those of xi are bound down by connective tissue to the walls of the oesophagus. The dorsal vessel seems not to be continued forwards beyond the gizzard, ending by giving a pair of commissures at the anterior end of this organ.

The micronephridia are arranged in a transverse row in each segment behind the clitellum; in the dorsal half of each segment there are pretty regularly three on each side.

The testis sacs are one pair, in segment xi; they are separate from each other and longitudinally elongated, lying by the side of the nerve cord. They are connected with the seminal vesicles in segment xii; these are large, two-lobed, the lobes being anterior and posterior; each lobe is subdivided by further indentations; they extend back to the level of 14/15 by bulging back the septa.

The prostates are small, occupying segments xviii and xix; the coils are closely packed. The duct is not markedly different from the glandular part; it is scarcely narrower, is soft, not shining, and passes forwards and inwards with an undulating course.

The female organs were not identified.

The spermathecae (fig. 48) are elongated sacs lying longitudinally on the body-wall, to which they are attached by a portion of their under surfaces; a duct can thus hardly be described,—it would at any rate be called very short and stout. The diverticula are two, one on each side, attached to the junction of sac and duct by a short relatively stout stalk; each shows a lobulation which indicates the presence of three or four seminal chambers.

The penial setae (fig. 49) are in length up to 1·5 mm., and in thickness 35μ; the distal half is slightly curved, and the tip bluntly pointed and rather claw-like. The ornamentation consists of very fine dot-like markings over the distal eighth or tenth of the length of the shaft, including the tip.

Remarks :—This species appears to be allied to *E. chittagongianus*; the internal anatomy is remarkably similar, and the chief difference between the two is in the genital markings. Although the present specimens were possibly not quite mature, it seems fairly safe to say that the markings differ in both character and position in the two forms.

Subfam. *TRIGASTRINAE.*

Genus **Eudichogaster.**

Eudichogaster ashworthi, Mchlsn.

Plate XI, figs. 50, 51.

I have lately received, by the kindness of Dr. J. H. Ashworth, two specimens of this species, of the same batch which furnished the types of the species described by Michaelsen (**2**). I need only add very few notes on the peculiarities exhibited by these.

The papillae of the spermathecal pores are not always symmetrical; in the specimen to which I devoted most attention, the papilla on the right side of segment viii took up about the middle two-fourths of the segment, that on the left side the anterior half; those on ix took up the anterior two-fifths of the segment, and encroached somewhat on the intersegmental furrow.

The gizzards in segments v and vi are short, and do not include the whole length of the oesophagus in these segments; a soft ring is thus left between the two, and another between the second and the hinder limit of its segment.

The specimen differed from Michaelsen's in the seminal vesicles; instead of vesicles in ix and xii, I find a pair in xii, a pair in x attached to the posterior septum of the segment, and a single vesicle in ix, on the left side only (one specimen only dissected).

I think Michaelsen's paper contains a slip where he speaks, in the diagnosis and again in the detailed description, of the diverticulum of the spermatheca entering the distal end of the duct. Michaelsen always uses the word distal to mean "nearer the surface of the body" (in such a case as the present, when speaking of an internal organ); the diverticulum however enters the duct at the ental end of the latter, just below the ampulla, and the same is the case in the numerous specimens to which reference is made below.[1]

The copulatory setae are, according to Michaelsen, found on the papillae of the male field (but not in connection with the prostatic apertures), and doubtfully in the neighbourhood of the spermathecal apertures; they are of a well defined type. In the specimen which I dissected I found them in the neighbourhood of the spermathecal

[1] There is a difference in the use of the words "proximal" and "distal" by English and German writers. I was taught to use them for "nearer to" and "remoter from, the fixed point of attachment"; and Beddard, for example, among writers on this group, uses the words in the same sense. Thus in such an organ as the spermatheca, which is attached by its duct to the inner surface of the body-wall and projects freely inwards into the coelom, a diverticulum attached to the duct near the body-wall would be proximal, and one attached to the duct near the ampulla would be distal as compared with the other. So for example in a well-known elementary textbook it is said that the testes of *Hydra* are distally situated, *i.e.* near the oral and distant from the fixed end of the animal. Michaelsen not infrequently queries Beddard's use of the words, and himself employs "proximal" and "distal" to signify respectively "nearness to" and "remoteness from, the central axis of the body." In view of this confusion I have for some time past used "ectal" and "ental" to signify "nearness to the surface of the body" and "nearness to the internal end," in the case of such structures as those under discussion.

pores, but not in the male region; for ready reference they are shown in fig. 50. From my examination of the specimens which are referred to below, I do not doubt that when special setae are found near the spermathecal pores they are of this type; but I have never found setae of this form in the neighbourhood of the male field, though other more slightly modified forms are not uncommon there.

Choral, between Khandwa and Indore, Central India. 23-vi-1917. B. Prashad. One sexual specimen and others smaller, doubtfully of the same species.

Saugor, Central Provinces. 20-vi-1917. B. Prashad. A single specimen.

Bina, Central Provinces. 19-vi-1917. B. Prashad. Numerous specimens, mostly immature, only three with sexual marks.

Teor, 8 miles from Jubbulpore, Central Provinces. 22-vi-1917. B. Prashad. A single specimen.

Partabgarh, S. Rajputana. Feb. 1918. Col. J. Manners-Smith. Two specimens, one immature, the other scarcely fully mature.

Poona, W. India. 3-vii-1917. B. Prashad. Several specimens, apparently mostly not fully mature.

Wahi, on the way to Mahableshwar, W. Ghats. 4-vii-1917. B. Prashad. Six specimens, two with sexual marks.

Some of the above specimens appeared at first to be worthy of separation as distinct varieties, on the ground of differences between them and Michaelsen's description,—especially as regards the copulatory setae of the spermathecal segments and of those of the neighbourhood of the male field, joined with the difference in the attachment of the spermathecal diverticulum. But a careful comparison of the specimens among themselves, and the examination of the co-types of the species, has shown me that the differences are not of great importance.

The majority of the specimens encountered are not fully mature; the clitellum is often wanting, even when all other marks of maturity are present. The length is often much less than that of the original examples;—lengths of 45, 56, 67 and 75 mm. were met with, in each case the best developed of the batch being measured.

The first segment may be divided by a median longitudinal furrow behind the prostomium.

The dorsal pores may begin in 11/12 instead of 12/13.

The papillae on or near the male field are variable. Those on xvi, or those on xx, may be absent; and I have not seen the paired papillae on segments xvii and xix internal to the male pores; there may however be median papillae on these segments.

Similarly with the papillae of the spermathecal region. In addition to those described by Michaelsen, there may be a pair on segment viii similar to those on ix outside the line of setae *b*, and a median papilla, it may be of considerable transverse extent, on x.

The seminal vesicles are in ix and xii, or in xii only; in this latter case it is possible that a second pair would have developed at a later stage. The prostatic duct is often straight, or only slightly bent; but the explanation may be the same.

The spermathecal diverticulum is in all cases attached to the ental end of the duct, or in one specimen to the base of the ampulla.

The copulatory setae of the spermathecal region, when found, are of the form

already mentioned. They are always longer than the measurement given by Michaelsen (who gives ·24 mm.),—usually about ·5 mm., and not less than ·4 mm.

The modified setae in the neighbourhood of the male field are not always, according to my experience, to be found. They are much less modified than those of the spermathecal region, and may even still retain the ordinary double curve with the nodulus; the sculpturing consists of a number of fine semicircular lines, concave towards the tip of the seta, or of a few faint transverse rows of closely set dots, or of zigzag lines which indent the surface of the seta sufficiently to produce irregularity of the margins (fig. 51).

Eudichogaster bengalensis, Mchlsn.

Bheraghat, Marble Rocks, 13 miles from Jubbulpore, Central Provinces. 22-vi-1917. B. Prashad. A single specimen.

The present species has been described by Michaelsen (**4**). As this is the second time it has been encountered, a few notes may be added to supplement the original account.

The prostomium I should describe as proepilobous, with a pair of shallow grooves dorsally on segment i; the grooves extend back over three-quarters of the segment, but not as far as the intersegmental furrow.

The first dorsal pore I found in furrow 11/12.

My specimen showed a series of papillae in the spermathecal region,—three pairs, on segments viii, ix, and x, oval in shape, white, including and extending beyond the setae *ab* both inwards and outwards.

The last heart is in segment xii.

As the nephridial system has been shown by Michaelsen to be of importance in this genus, and as his specimens were considerably softened and so not favourable for examination, I give the results of my own dissection. The individual micronephridia are large and few; two longitudinal series are to be seen on each side of the body in and behind the prostatic region; *i.e.* there are only two on each side of each segment. At about one-third of the length of the animal from the posterior end the two are still present, and similar in appearance; though the outer, which extends on the body-wall from the site of seta *c* to half-way between *d* and the middorsal line, is larger than the inner, which only takes up a space equal to the interval *bc*. A little behind this the inner becomes more opaque and rather bulkier than before, and so more conspicuous. Towards the hinder end it maintains these characters, and increasing in size also so as to include the interval *a* to *c*, it becomes much more conspicuous than the outer nephridium, which has rather diminished in size. I think there may be a few very minute micronephridia on the body-wall in addition to the series described above, but the condition of the specimen is none too good, though apparently better than Michaelsen's.

The penial setae are not ornamented so markedly as in the type. The spines are extremely fine, and are arranged in short transverse rows; there is no specially projecting brush-like circle near the tip.

Eudichogaster trichochaetus, sp. nov.

Plate XI, figs. 52, 53.

Bombay, Victoria Gardens. 30-vi-1917. B. Prashad. Numerous specimens, some immature.
Bombay, near Colaba Railway Station. 1-vii-1917. B. Prashad. Seven specimens.
Bombay, under a tree near the Fort. 30-vi-1917. B. Prashad. Three specimens.
Palchar, N. of Bombay, between Bombay and Surat. 7-vii-1917. B. Prashad. A number of specimens. Two showing sexual marks.

External Characters:—Length 32–45 mm.; diameter 1·75–2·25 mm. Colour a yellowish grey, no difference between dorsal and ventral surfaces. Segments 103–128.

Prostomium epilobous 2/5, pointed behind, the point continued back as a groove which divides the dorsal surface of the first segment; or in some cases the prostomium itself appears to be prolonged backwards so that the point is at the furrow 1/2.

Dorsal pores begin from furrow 12/13 or 13/14.

The ratios of the setal intervals may be expressed thus:—$ab = \frac{1}{3}$ to $\frac{2}{5}aa = \frac{1}{2}bc = \frac{3}{4}cd$ from behind the male genital region backwards; in front of the clitellum the ratios are less regular, but *ab* is certainly wider, equal about to half *aa*; *dd* is nearly half the circumference.

I have never found a recognizable clitellum.

The male field is a rectangular thickening, whitish in colour, taking up segments xvii-xix, and extending laterally on each side to between the lines of *b* and *c*; it may extend slightly on to segments xvi and xx. The prostatic apertures are small transverse slits corresponding in extent to the interval *ab*, on segments xvii and xix. The seminal grooves pass longitudinally between the outer ends of the prostatic pores of the same side, and are thus in the line *b*, and some little distance internal to the lateral border of the thickened area.

The female pores may be indicated by a pair of tiny white thickenings just in front of, and internal to setae *a* on segment xiv.

The spermathecal pores were not seen externally. There is some thickening ventrally on segments viii and ix, indefinite, and perhaps more specially marked round the site of the ventral setal couple.

Internal Anatomy:—Septum 4/5 is somewhat strengthened, 5/6–7/8 are thin, 8/9 is somewhat strengthened, 9/10 slightly so, the rest thin.

The two gizzards are relatively large, in segments v and vi. The calciferous glands, three pairs, in segments x, xi, and xii, are not set off from the oesophagus. The intestine begins in xiv (?).

The last heart is apparently in xii.

The micronephridia are arranged in four longitudinal rows on each side of the body; they are small twisted tubes, those of the innermost series on each side the smallest, and situated near the next outer row.

Testes and funnels are apparently free in segments x and xi (judged from the masses of free flocculent material in these segments). Seminal vesicles are present in segment xii only, as considerable masses with lobate margins.

The prostates are two pairs of relatively moderate size, twisted tubes lying in segments xvii and xix.

The spermathecae are two pairs, in segments viii and ix, ending apparently on the body-wall between the site of setae *a* and *b*. The ampulla is ovoid, rather elongated and with a somewhat pointed blind end, the duct as long as the ampulla, but not distinctly marked off, a little wider above. The diverticulum is single, shortly finger-shaped, one-third as long as the ampulla, to the lower end of which it is attached.

The penial setae are remarkable. In length they measure up to 2 mm.; but notwithstanding this they and their sacs were quite invisible in the dissection, and the prostatic duct was pulled out and mounted merely on the chance of getting something (the setal sacs are practically always identifiable, and can usually be isolated and removed separately; but in some cases, such as the small *Dichogasters*, the only practicable way is to remove prostates and setal sacs together). The setae are very slender, 5-6μ in thickness, diminishing to 4·5μ near the tip. In shape they are undulating; there is no ornamentation, but where the tip is best seen it appears bifid, with a thin transparent web between the prongs of the fork; the base of the expanded portion is 9μ, and the length of the triangular web 18μ (fig. 52).

The copulatory setae of the spermathecal region are ·42 mm. in length, and 13μ thick in the middle. The shaft is almost straight, with a bend at the proximal end however; the tip is slightly claw-shaped and bluntly pointed. The ornamentation consists of short transverse ridges on the distal part of the shaft (fig. 53).

Eudichogaster prashadi, sp. nov.

Plate XI, fig. 54.

Palia, between Indore and Ujjain. 27-vi-1917. B. Prashad. Several specimens, only two with sexual marks.

Indore, Central India. 23-vi-1917. B. Prashad. A single specimen.

Mhow Cant., Central India. 23-vi-1917. B. Prashad. A single specimen.

Khandwa, Central Provinces. 23-vi-1917. B. Prashad. Several specimens.

Bheraghat, Marble Rocks, 13 miles from Jubbulpore. 22-vi-1917. B. Prashad. Several specimens.

Teor, 8 miles from Jubbulpore, Central Provinces. 22-vi-1917. B. Prashad. Several specimens, mostly immature.

Saugor, Central Provinces. 20-vi-1917. B. Prashad. Numerous specimens.

Surat, W. India. 8-vii-1917. B. Prashad. Several specimens.

Poona, W. India; on the banks of the Rivers Mula and Mutta. 3-vii-1917. B. Prashad. Four specimens, only one showing distinct signs of maturity.

External Characters:—Length 35-67 mm., diameter 3-4·5 mm. Colour yellowish brown, with only slight difference between dorsal and ventral surfaces; the first few segments lighter. Segments 140-168.

Prostomium prolobous; there may be a mid-dorsal groove on the first segment, sometimes with an irregular course.

Dorsal pores from furrow 11/12 or 12/13.

The setal intervals vary somewhat; *ab* may be anything from $\frac{1}{5}$ to $\frac{1}{3}$ of *aa*, and over the greater part of the body=about $\frac{2}{5}$ *bc* and $\frac{3}{4}$*cd*; in front of the male apertures *bc* becomes rather smaller, and *cd* increases; the interval *ab* is smallest immediately behind the male field. The mid-dorsal interval *dd* is about $\frac{2}{3}$ of the circumference. Towards the anterior end the setae are difficult to see.

I never saw a distinguishable clitellum.

The appearances of the male field are also not very definite, but such as they are, they are pretty constant. The chief feature is the existence on each of the segments xvii and xix of a pair of ill-defined papillae, perhaps better described as whitish thickenings of the body-wall; these are generally transverse in direction, and have their centres somewhere near the line *b*, extending inwards and outwards to a variable extent; their limits are rather indistinct. On segment xviii there is usually a similar thickening which unites the outer parts of the thickenings on xvii and xix, thus making a crescentic swelling with its concavity inwards on each side (fig. 54*a*).

The prostatic pores are in or just internal to the line of setae *b*, on segments xvii and xix; the seminal grooves bend inwards slightly at the middle of their length, somewhat as in *E. ashworthi*. I saw the pores of the vasa deferentia in one specimen, on xviii in *b*, at the apex of the inward bend in the course of the seminal grooves; their anterior and posterior lips were slightly tumid.

The female pore or pores are perhaps contained within a minute white spot mid-ventral and anteriorly situated on xiv.

There are small transversely elongated white cushions on segments viii and ix, in the position of the ventral setal bundle. From internal dissection the spermathecae appear to discharge between the sites of setae *a* and *b* on these segments.

Internal Anatomy :—Septum 4/5 is thin; 5/6 to 9/10 are moderately strengthened, 10/11 slightly so, 11/12 still less, and the rest are thin.

The gizzards, large, rounded, and firm, are in segments v and vi; they are separated by a soft-walled part of the oesophagus in the anterior part of segment vi. The calciferous glands, in segments xi and xii, are shortly ovoid, and joined to the gut by a short stalk on the inner side. The intestine begins in xv.

The last heart is in segment xii.

Behind the genital region the micronephridia are in a transverse row on each side of each segment, and so arranged that the corresponding organs follow behind each other in longitudinal rows; of these there are about five on each side of the body. Towards the hinder end of the body the innermost nephridium of each transverse row on each side,—that by the side of the ventral nerve cord,—increases in size and thickness, and though still small is much the most conspicuous; the others of the row become individually smaller and increase in number, and lose the regularity of the arrangement in longitudinal rows.

Testes and funnels are free in segments x and xi; those in the two segments are equal in size. Seminal vesicles are present in segments ix and xii; in one specimen

dissected I found them only in xii, perhaps because the specimen was not fully mature.

The prostates are two pairs, in xvii and xix, small thin convoluted tubes with a generally transverse direction. The ducts are of the same diameter as the glandular part, but a little more shiny in appearance; they lie transversely.

The spermathecae are two pairs, in segments viii and ix; the ampulla is an elongated ovoid sac, and the duct cylindrical and as long as the ampulla. There is a single diverticulum, ovoid, not apparently containing any seminal chambers, attached by a short thick stalk to the base of the ampulla; it is bound down to the duct and base of the ampulla by connective tissue.

There are no penial setae.

The copulatory setae of the spermathecal region are not unlike those of *E. ashworthi*; they seem to be always present. In length they measure ·47 mm., and are 16μ thick in the middle; they are almost straight, slightly bowed towards the distal end; the thickness does not diminish much till close to the tip, which is pointed and rather claw-shaped. The distal fifth of the shaft is marked by a number of large hollows scooped out of the shaft, each with a sharply defined and prominent proximal border, crescentic with the concavity towards the tip; the distal margin of each excavation slopes gently, and is not well marked (fig. 54*b*).

Remarks:—It is curious that the period of sexual maturity in some of these worms is so restricted,—that is if the presence of a clitellum is to be taken as a sign of complete maturity.

The present form has much in common with *E. indica* (Beddard). The latter however appears to be distinguished by the great separation of the lateral setae ($cd = 2\frac{1}{2}ab$), by median genital papillae behind the spermathecal region, and by possessing only one pair of seminal vesicles.

Eudichogaster falcifer, sp. nov.

Plate XI, fig. 55.

Jubbulpore, Central Provinces. 22-vi-1917. B. Prashad. A number of specimens.

Bheraghat, Marble Rocks, 13 miles from Jubbulpore. 22-vi-1917. B. Prashad. A number of specimens.

Saugor, Central Provinces. 20-vi-1917. B. Prashad. A single specimen.

External Characters:—Length 40 mm.; thickness 2 mm. Colour a nondescript yellowish grey, no difference between dorsal and ventral surfaces, the anterior end lighter. Segments 128.

Prostomium proepilobous.

Dorsal pores from furrow 12/13.

The setal intervals may be expressed as follows:—*ab* in the middle of the body is rather greater than $\frac{1}{2}bc$ but rather less than $\frac{1}{2}aa$, and is nearly equal to *cd*; behind the genital region *ab* is about equal to $\frac{1}{2}aa$ and to $\frac{1}{2}bc$, though *aa* seems just a little larger than *bc*; in front of the genital region $ab = \frac{3}{5}aa = \frac{3}{5}bc = \frac{3}{4}cd$; *dd* is about $\frac{3}{5}$ of the circumference.

The clitellum was indistinguishable.

The male field is represented by a very slight whitening and thickening of the ventral surface of segments xvii to xix. The lateral parts of this area are better marked, and constitute definite ridges, which turning inwards at their anterior and posterior ends enclose the centre of the area as within brackets: in the longitudinal portion of their course the ridges lie a little outside the line *b*.

The seminal grooves are crescentic, the convexity outwards; they begin and end in the position of seta *a* on xvii and xix, and the prostatic apertures are presumably situated at these points; the grooves by their outward curve just get outside the line of setae *b* at the middle of their length.

The female pores were not visible.

There was nothing to be seen in the spermathecal region.

Internal Anatomy :—I could not distinguish any septa in front of 6/7, which is thin; 7/8 is thin, 8/9 to 10/11 slightly thickened, the rest thin.

There are two large gizzards in segments vi and vii. The calciferous glands are three pairs, roundly ovoid masses in segments x, xi, and xii. The intestine begins in xv.

The last heart is in segment xii.

Funnels were identified, perhaps somewhat doubtfully, lying free in segments x and xi. The seminal vesicles are two pairs, in ix and xii, yellowish in colour, of moderate size, somewhat lobulated and rather granular-looking on the surface.

The prostates were scarcely developed.

The spermathecae are two pairs, the ampulla of each a small ovoid sac which narrows ectally to become the duct; the duct may be said to be half as long and half as wide as the ampulla. A simple finger-shaped diverticulum, half as long as the ampulla, arises from the junction of ampulla and duct.

The penial setae are characteristic; their length is ·3 mm., their thickness 8-9/. The distal portion shows a gentle sickle-shaped curve, the tip being slightly bent in the opposite direction and bluntly pointed. There may be a constriction where the curved distal meets the straight proximal portion of the shaft. Towards the tip are a number of indentations of the margins, which however do not form spines standing off from the shaft (fig. 55).

Eudichogaster pusillus, sp. nov.

Plate XI, figs. 56, 57.

Saugor, Central Provinces. 20·vi·1917. B. Prashad. A single specimen, damaged some distance behind the clitellum

External Characters :—Length 28 mm.; diameter maximum 1·5 mm. Colour greyish, not distinctive; clitellum a reddish-brown. Segments ca. 110.

Prostomium proepilobous.

Dorsal pores not seen in front of clitellum.

The setal relations are as follows:—In the middle of the body *ab* = half *aa* =

$\frac{2}{3}bc = \frac{3}{4}cd$ or almost so,—there is very little difference between *bc* and *cd*; immediately behind the clitellum the ratios may be expressed in the same way; in front of the clitellum *bc* and *cd* are quite equal, —*i.e.* the lateral setae are not paired (*ab* = half *aa* = $\frac{2}{3}bc = \frac{2}{3}cd$).

The clitellum is well defined, swollen, smooth, and includes segments xiii-xvi ventrally, with xvii in addition laterally and dorsally (= 4 or 5).

The prostatic pores, on xvii, are a single pair of transverse slits which take up the interval *ab*.

The female pores are probably contained in a whitish area situated anteriorly on segment xiv; this is somewhat oval, with its long axis transverse and extending between the lines *aa*; it is slightly hollowed.

The spermathecal pores could not be distinguished externally.

Internal Anatomy :—Septa 7/8-13/14 are slightly thickened.

There are two relatively very large gizzards, probably in segments v and vi, perhaps in vi and vii. There are three pairs of calciferous glands, in segments x, xi, and xii; they are ovoid, and not sharply set off from the oesophagus; those in x are the largest, those in xi the smallest. The intestine begins in xv.

The last hearts are in segment xii.

The excretory system is micronephridial.

Funnels were doubtfully identified in segments x and xi; the worm is of small size, and had possibly passed its period of maturity. A single seminal vesicle was found, on the right side in segment ix; none were seen in xii or elsewhere.

The prostates are one pair, short tubes in segment xvii, bent once or twice. The duct is much narrower than the glandular part,—is indeed very fine, but widens gradually towards its ectal end; it is opaque white in colour, not shining, almost as long as the gland, and runs transversely inwards.

A pair of relatively very large ovaries were found in xiii; the ova were seen as large opaque white bodies, arranged in a fern-like manner. The funnels were also of large size. A pair of ovisacs projected backwards from septum 13/14 into segment xiv; they contained large ova.

The single pair of spermathecae are contained in segment vii, and appear to open in or near furrow 7/8. Their appearance is peculiar (fig. 56); each is a long narrow twisted cylindrical tube, somewhat wider at its ectal end, where a short muscular duct,—only a fraction of the length of the ampulla, and about one-third as wide,—leads to the exterior. There is no diverticulum. The whole organ looks at first sight remarkably like a nephridium.

The penial setae (fig. 57) are relatively long compared with their thickness; they measure ·56 mm., and are only 4μ thick in the middle. The shaft is almost straight, or at any rate is not regularly curved; it tapers very gently towards the tip, which is flattened and slightly expanded.

Remarks:—This form seems to resemble *E. parvus* (Fedarb), but is to be distinguished by the presence of penial setae and the position of the calciferous glands and seminal vesicles.

Eudichogaster kinneari, sp. nov.

(Plate XI, figs. 58, 59.)

Nasik, 100 miles N.E. of Bombay, W. India. 22-ix-1914. N. B. Kinnear. A number of specimens.

External Characters :—The length of a fair-sized specimen is 80 mm.; the diameter behind the clitellum is 3·5 mm., while the bulbous anterior end is about 5 mm. thick at the sixth segment. Colour buff, no difference between dorsal and ventral surfaces, the clitellum brown. Segments of a fair-sized specimen about 120; segments iv-vi are biannular, vii and viii quadriannular, ix and subsequent segments up to the clitellum triannular with secondary subdivisions; triannulation again becomes marked towards the hinder end of the body.

The prostomium is small, prolobous, and withdrawn into the buccal cavity; the first segment is small, and it is divided by a mid-dorsal longitudinal groove,—a well marked and constant character.

The first dorsal pore is at the anterior border of the clitellum, in furrow 12/13.

Behind the clitellum, and in the body generally, the setal ratios may be expressed thus:—$ab = \frac{1}{4}$ to $\frac{1}{3}$ $aa = \frac{1}{3}$ to $\frac{1}{2}$ $bc = \frac{3}{4}$ cd; ab is not very regular however. In front of the clitellum bc diminishes very considerably; anteriorly it becomes less than half aa and only about $1\frac{1}{2}$ times ab, and only slightly greater than cd; the ventral couples are still widely separated from each other. The mid-dorsal interval dd is about $\frac{5}{8}$ of the circumference.

The clitellum is extremely well marked; it is brown in colour, swollen, and extends over segments xiii-xvi (= 4); it is deficient in a **V**-shaped interval ventrally on xiii. Dorsal pores and indications of furrows are visible, but not setae.

The male field is rectangular, its transverse extent greater than the longitudinal (fig. 58); it includes segments xvii-xix. The margins, especially the lateral, are much thickened; from the anterior and posterior two tongues project, backwards and forwards respectively, into the central depressed space, so that this becomes **H**-shaped. The floor of the **H**-shaped depression is deeply fissured; in it two pairs of papillae, one pair in each of segments xvii and xix, in the four corners of the **H**, represent the prostatic apertures. The seminal grooves are not always distinguishable among the numerous fissures of this region; they are like those of *E. ashworthi* and *E. prashadi*, with an inward bend at the middle of their course, thus $\begin{pmatrix} & \\ & \end{pmatrix}$.

The female pores appear to be situated in a broadly spindle-shaped whitish area, which shows up markedly against the brown of the clitellum, anteriorly and mid-ventrally on segment xiv.

The spermathecal apertures are on the anterior part of the second annulus of segments viii and ix, in the line of a. Each is in the centre of a low squarish papilla, which takes up the greater part of the length of the segment.

There are numerous other papillae both in the region of the male field and also near the spermathecal pores. Almost constant are two pairs, with clean cut edges,

one on the posterior part of xvi, the other taking up most of the length of xx; these extend from about, or within, the line *a* to the lateral margin of the body; they are transversely oval in shape, and slightly depressed in the middle; the anterior pair may be narrower from front to back than the posterior. In a number of cases there are also median papillae, circular in outline, on one or both of these segments (xvi and xx). In the spermathecal region other papillae are usually found to the outer side of and touching those already described on segments viii and ix; these are circular, and include the lateral setal bundles; there may even be two such papillae on one side. Median papillae are often found in this region also, on the anterior part of segments x, xi and (once) xii.

Internal Anatomy:—Septum 4/5 is thin, 5/6-11/12 are moderately strengthened, the rest thin.

The gizzards, in segments v and vi, are large, firm, and globular. The calciferous glands are two pairs, in segments xi and xii; they are small, ovoid, well set off from the gut, and with smooth surface, not lobed. The canal swells out to form the intestine in xv, but is much narrowed again as it passes between the bulky prostates.

The last hearts are in segment xii. There is a pair of large oblique vessels in xiii, but these do not join the dorsal vessel as do the hearts,—certainly not at the usual place, the hinder border of the segment.

The micronephridia are scattered in the anterior segments. Behind segment x they are arranged in regular transverse rows; behind the prostates there are about six on each side of each segment; of these the more dorsal are in regular longitudinal rows, while the two most ventrally situated are closer together and not so regular. Towards the hinder end of the animal the innermost on each side in each segment becomes much thickened and more opaque, and thus, though it takes up no more space transversely, it is much more conspicuous than the rest. The other five maintain their number and regularity however to within a very few segments of the end.

Testes and funnels, the latter of large size, are free in segments x and xi. Seminal vesicles are present in segments ix and xii; those in ix are small, those in xii much larger, lobed, and bulging back septum 12/13.

The prostates are large, the anterior pair extending over xviii and xix, or xvii, xviii, and xix and even getting into xx; the posterior pair occupies xx and xxi; thus they overlap. The glandular part consists of closely adpressed coils. The duct is much thinner, though rather wider as it approaches its termination; it is shining, and thrown into one or two loops. Each duct leads forwards to end in the usual situation.

The spermathecae are two pairs, in segments viii and ix. The ampulla is ovoid, of moderately large size, and shows slight annulation; the duct is well marked off from the ampulla, and is half as long and two-fifths as thick as the latter; it narrows towards its ectal end. The diverticulum is single, and consists of a large number of minute seminal chambers, the whole attached by a short thick stalk to the ental end of the duct (fig. 59).

Penial setae are absent.

The copulatory setae of the spermathecal region are in their ornamentation exactly similar to those of *E. prashadi*, and no separate figure is needed. In length they measured from ·73 to ·87 mm., in thickness 25μ at the middle; and the extent of the shaft occupied by the sculpturings is about one-third of its length. It is noteworthy that whereas in most cases it is the ventral setae of segments viii and ix which are modified, here the lateral setae, included in the lateral papillae on these segments, may also develop as "copulatory setae."

Genus **Dichogaster**.

Dichogaster bolaui (Mchlsn.).

Bombay. June 1915. N. B. Kinnear. Several specimens.

Bassein Road, N. of Bombay, W. India. 7-vii-1917. B. Prashad. Four specimens.

Baroda, W. India. 9-vii-1917. B. Prashad. Two specimens.

Bayana, 20 miles S.W. of Bharatpur, E. Rajputana. 15-vii-1917. B. Prashad. A single specimen.

var. **malabaricus**, var. nov.

Bombay; under a tree near the Fort. 30-vi-1917. B. Prashad. A single specimen.

External Characters:—Length 31 mm.; diameter 2·25 mm. Colour buff, unpigmented except for a dark mid-dorsal stripe. Segments 86.

Prostomium prolobous.

A conspicuous dorsal pore is seen in furrow 5/6, and then no more till 11/12, where there is a rudimentary one. The pores are well marked from 12/13 onwards.

In the middle of the body the setal relations are as follows:—$ab = \frac{1}{4}aa = \frac{1}{4}bc = cd$; and they are about the same in the region behind the clitellum; in front of the clitellum all the pairs are closer together, more distinctly ventral, and *dd*, which behind is about $\frac{4}{7}$ of the circumference, consequently increases.

The clitellum extends over xiii-xx (=8); dorsally it almost covers xxi in addition. It is ring-shaped over xiii, a little thinner ventrally in xiv, xv, and xvi and thenceforward interrupted ventrally. The region is swollen, and well defined at each end.

The seminal grooves run in the interval *ab*; they are straight, and bordered by whitish thickened lips; the inner lips of the grooves are almost contiguous in the middle line.

The spermathecal apertures were not visible. The ventral surface of segment viii, and perhaps of ix, appears slightly thickened, and the setae rather displaced and irregularly set.

Internal Anatomy:—Septum 4/5 is slightly strengthened; if 5/6 and 6/7 are present, they are not discernible in this specimen (which is not in very good preservation); 7/8 is thin, 8/9 and 9/10 perhaps slightly thickened, the rest thin.

The gizzards are in segments vii and viii, and the alimentary tube is scarcely constricted between them. The calciferous glands are kidney-shaped, with the hilus turned inwards, and occupy segments xv, xvi, and xvii. The intestine begins in xviii.

The last heart is in xii.

The testes and funnels were not identified in segment x, but they seemed to be present in xi. There were very small racemose seminal vesicles in segment xii.

The ovaries had the usual situation; there were small ovisacs in segment xiv.

The prostates and two kinds of penial setae are as for the typical form. The spermathecae however present one of the peculiar features which distinguish this worm as a separate variety; there are two diverticula, small, sessile, attached about the middle of the duct.

Remarks :—The two spermathecal diverticula, and the fact that the clitellum is not saddle-shaped throughout its extent, seem to warrant the separation of this form as a distinct variety.

Dichogaster affinis (Mchlsn.).

Baroda, W. India, in a garden. 10-vii-1917. B. Prashad. Two specimens.
Bombay, under a tree near the Fort. 30-vi-1917. B. Prashad. A single specimen.
Bombay, Elephanta Island, in a rotten tree. 30-vi-1917. B. Prashad. Four specimens

Dichogaster crawi, Eisen.

Pashok, 3500 ft., Darjiling Dist., E. Himalayas. 1-12-x-1917. F. H. Gravely. A single specimen.

Remarks :—This species has not hitherto been recorded from India; it was described by Eisen from the Pacific Coast of N. America, and its occurrence in India may thus be compared with that of *D. bolaui* subsp. *palmicola* (**12**).

Subfam. *OCNERODRILINAE.*

Genus **Ocnerodrilus.**

Ocnerodrilus (Ocnerodrilus) occidentalis, Eisen.

Bombay. June 1915. N. B. Kinnear. A number of specimens.
Kotah, Rajputana. 14-vii-1917. B. Prashad. A number of specimens.

The specimens of the batch from Kotah show some of the characters of Eisen's var. *arizonae*. I have previously on a similar occasion (**9**) had the opportunity of confirming Michaelsen's opinion of the non-validity of this variety.

Fam. GLOSSOSCOLECIDAE

Subfam. *GLOSSOSCOLECINAE.*

Genus **Pontoscolex.**

Pontoscolex corethrurus (Fr. Müll.).

Bombay. June 1915. N. B. Kinnear. Two specimens, immature.
Poona, W. India, Empress Gardens. 3-vii-1917. B Prashad. Seventeen specimens, some immature.

Subfam. *MICROCHAETINAE.*

Genus **Glyphidrilus.**

Glyphidrilus papillatus (Rosa).

Lucknow. 15-i-1918. G. S. Thapar A number of specimens

The worm has been described by Rosa from Burma, from a single specimen which was not in very good condition, and not fully mature. As I have had a considerable number of examples, carefully preserved by Mr. Thapar, to whom my thanks are due for these interesting specimens, I give below a fairly complete description.

External Characters :—Length 120 mm. ; diameter at and in front of the clitellar region 3 mm., behind the clitellum 2 mm. Colour flesh-colour or greyish, no distinct pigmentation ; a slightly darker mid-dorsal stripe. The posterior half of the body is flattened on the dorsal side, and even concave in the hinder third ; the ventral surface is flattened or slightly concave for the greater part of its extent. Segments 202 in the example which was counted. Segment vi is biannulate, vii is triannular, and so are viii and ix, but these may be further subdivided ; the succeeding segments as far as xv are bi- or triannulate. The anterior end of the body is tapering ; the posterior end becomes gradually thinner also.

The prostomium is large, zygolobous, and triangular. Dorsal pores are absent.

The setae are paired ; behind the clitellum, the section of the body being somewhat quadrangular, the couples are at the four angles ; *ab* is a little less than half *aa*, is equal to half *bc*, and is equal to *cd* ; *dd* is a little but not much greater than *aa*. The setae become very small in front of the clitellum, and also wider apart. In the posterior part of the body the setae are still at the angles, but the intervals are rather different ; *dd* becomes larger and *bc* smaller ; $ab = \frac{2}{5}aa =$ half $bc = cd = \frac{2}{7}dd$.

Under close examination the anterior segments showed rings of minute pits ; these were on the middle annulus where the segments were multiannular ; possibly they represent sense organs.

The clitellum is rather indefinite in its extent ; beginning at segment xvi it extends back to xxvi-xxxiv. The wing-like ridges extend ventro-laterally along each side from segment xviii to xxiii, xxiv, xxv, or the anterior part of xxvi ; they arise from the body-wall outside the line of the ventral setal couples.

The characteristic papillae are large, round, flattened or slightly depressed in the middle, and situated on the posterior parts of the segments. They are lateral or median ; the former series occur in line with or slightly dorsal to the attachment of the winglike folds of the body-wall, are usually paired, and may be found on any of the segments x-xvii, as well as occasionally on xxiii, xxv, or xxvi ; they are commonest on xiii-xvii, especially xv-xvii. The median papillae are not so common as the lateral ; I have found them only on xi-xv, and xvii and xviii. Median papillae may be absent altogether ; the lateral papillae may be as few as two pairs, or two on one side and one only on the other.

Internal Anatomy :—The first definite septum is 4/5, which is thin ; 5/6 is slightly, 6/7-9/10 moderately, and a few succeeding ones slightly thickened.

The gizzard is in segments vii and viii ; septum 7/8 is adherent to it at about its middle, but there is no constriction there ; it is rather small, being no wider than the preceding segments, and is fairly soft. The intestine begins in segment xvi.

Hearts are present in segments x and xi, and, in the specimen dissected, on the right side in ix also.

There was much flocculent matter in segments x and xi, and much of it was tenacious and iridescent, seeming to indicate the presence of seminal funnels; but neither testes nor funnels were actually identified. The seminal vesicles are four pairs, but they are not always symmetrical in each segment; thus in ix there was a large one on the right, a small one on the left, while in x the condition was the opposite; in xi there was a separate round lobe on the left side in addition to the normal vesicle. The vesicles are usually deeply lobed.

There were no prostates.

The ovaries have the usual situation. I can confirm the presence of ovisacs in xiv; there appears to be a pair of exactly similar structures in xv.

The spermathecae, which were not present in Rosa's specimen, are in four series on each side, each series consisting of a transverse row of five, opening in furrows 13/14-16/17. In addition there was a single one on the right side opening in 12/13. Each spermatheca is a small ovoid or irregularly elongated saccule, its blind end directed backwards, and the whole adherent to the body-wall. The position of the five organs on each side is thus:—one in each of the lines *a*, *b*, *c*, and *d*, and one between *b* and *c*.

Fam. LUMBRICIDAE.

Genus **Helodrilus.**

Helodrilus caliginosus (Sav.) var. **trapezoides** (Ant. Dug.).

Mount Abu, S. Rajputana. Col. J. Manners-Smith. March 1918. Very numerous specimens.

Nasratabad, Seistan, E Persia, from a garden. 25-xi-1918. N. Annandale and S. W. Kemp A number of specimens.

Helodrilus parvus (Eisen).

Partabgarh, S. Rajputana. Feb. 1918 Col. J. Manners-Smith. A single specimen.

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EXPLANATION OF PLATE IX.

FIG. 1.—*Nais paraguayensis*; needles of the dorsal bundles; *a*, with bifid outer prong; *b*, with bent inner prong.

,, 2.—*Nais paraguayensis* var. *aequalis*; dorsal needle, × *ca.* 1200.

,, 3.—*Nais gwaliorensis*; dorsal needle, × *ca.* 1100.

,, 4.—The same; ventral setae; *a*, of segments behind v; *b*, of segments ii-v; × *ca.* 1100.

,, 5.—*Megascolides prashadi*; male genital field.

,, 6.—The same; spermatheca.

,, 7.—*Perionyx sansibaricus*; region of male apertures.

,, 8.—*Perionyx millardi*; spermathecae showing different characters of diverticula; *a*, specimen from Virar; *b*, from Talegaon; *c*, from Kalyan.

,, 9.—*Perionyx rimatus*; spermatheca.

,, 10.—*Perionyx pokhrianus*; male genital field.

,, 11.—The same; spermatheca.

,, 12.—*Perionyx pokhrianus* var. *affinis*; male genital field.

,, 13.—The same; spermatheca.

,, 14.—*Perionyx alatus*; male genital field.

,, 15.—The same; spermatheca.

,, 16.—The same; tip of penial seta, × *ca.* 250.

,, 17.—*Perionyx shillongensis*; spermatheca.

,, 18.—*Perionyx fossus*; spermatheca.

,, 19.—The same: tip of penial seta, × *ca.* 400.

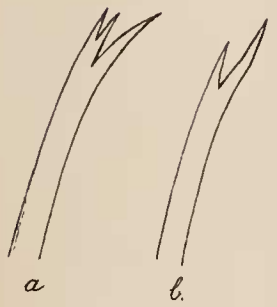
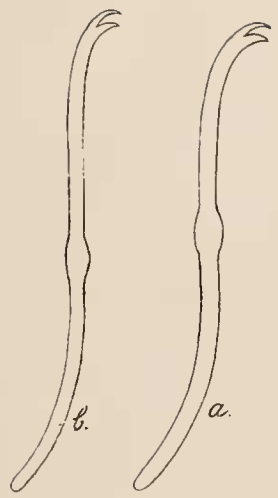


Fig. 1.

Fig. 2.

Fig. 3.



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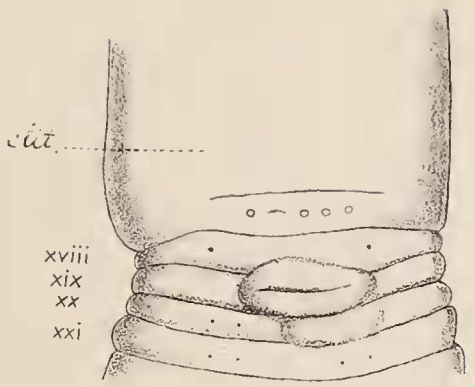

Fig. 5.

Fig. 6.

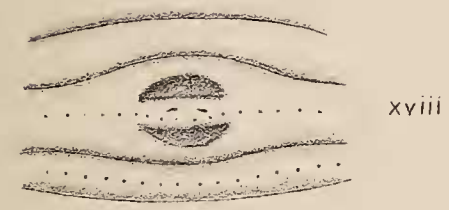

Fig. 7.

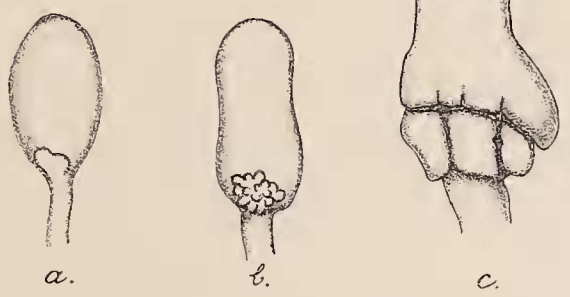

Fig. 8.

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Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13.

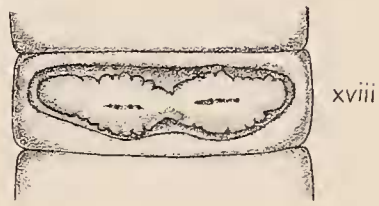


Fig. 14.

Fig. 15.

Fig. 16.

Fig. 17.

Fig. 18.

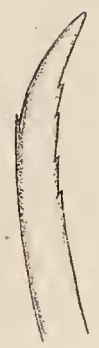


Fig. 19.

J. Stephenson del.

A. Chowdhary lith.

INDIAN & PERSIAN OLIGOCHAETA.

EXPLANATION OF PLATE X.

FIG. 20.—*Perionyx turaensis*; spermatheca, × 40.

,, 21.—The same; tip of penial seta, × 700.

,, 22.—*Perionyx pullus*: spermatheca.

,, 23.—*Perionyx minimus*; spermatheca as seen under the microscope.

,, 24.—*Perionyx igatpuriensis*; spermatheca.

,, 25.—*Hoplochaetella anomala*; male genital area.

,, 26.—The same; diagram showing relations of prostatic ducts and vasa deferentia. *Gl.*, prostatic gland (the coils are not intended to be shown with exactitude); *p.d.*, prostatic duct; *v.d.*, the two vasa deferentia.

,, 27.—The same; spermatheca.

,, 28.—The same; sketch showing relations of accessory gland in neighbourhood of spermatheca and copulatory seta, extracted together and seen under microscope.

,, 29.—The same; tip of copulatory seta.

,, 30.—*Octochaetus paliensis*; spermatheca.

,, 31.—The same; penial setae, both from the same specimen as the above; × *ca.* 340.

,, 32.—The same; copulatory seta, from same specimen as the above; × *ca.* 230.

,, 33.—The same; spermatheca of specimen from Poona.

,, 34.—*Octochaetus paliensis* var. *riparius*; male genital region.

,, 35.—The same; copulatory seta, × *ca.* 350.

,, 36.—*Octochaetus prashadi*; spermatheca.

,, 37.—The same; tip of penial seta, × *ca.* 175.

,, 38.—The same; tip of copulatory seta, × 375.

,, 39.—*Octochaetus montanus*; spermatheca.

,, 40.—The same; penial seta, × 40.

Fig. 20.

Fig. 21.

Fig. 22

Fig. 23

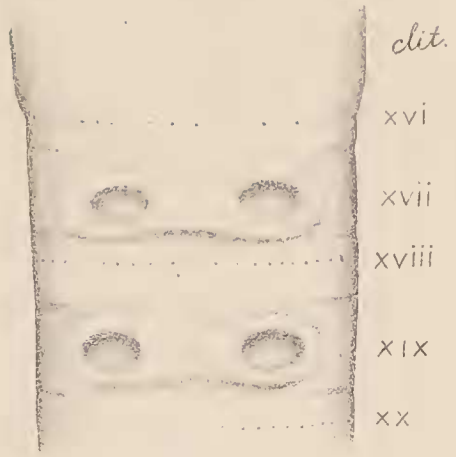
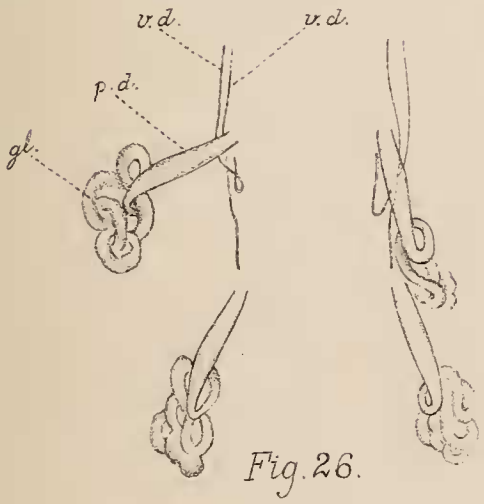


Fig. 25.

Fig. 24.

Fig. 27.



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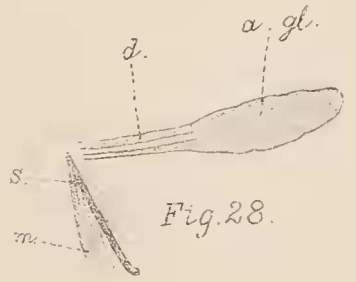

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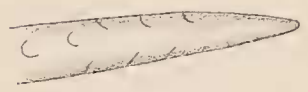

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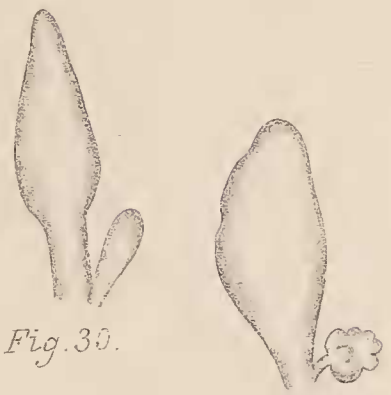

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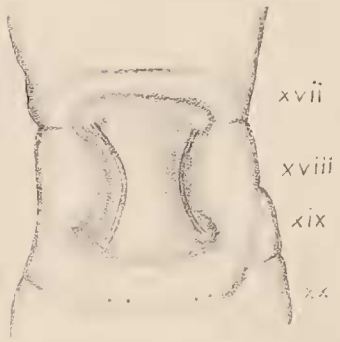

Fig. 34.

Fig. 32.

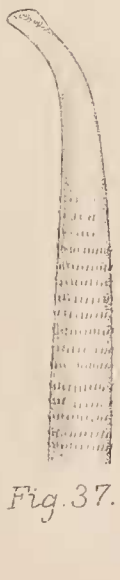

Fig. 37.

Fig 35.

Fig. 36.

Fig. 31.

Fig. 38

Fig. 39.

Fig 40.

J. Stephenson del.

INDIAN & PERSIAN OLIGOCHAETA.

S.C. Mondul lith.

EXPLANATION OF PLATE XI.

FIG. 41.—*Octochaetus pallidus*; spermatheca.
,, 42.—The same; tip of penial seta, × 600.
,, 43.—*Octochaetus ganeshae*; spermatheca.
,, 44.—The same; tip of penial seta, × 600.
,, 45.—The same; tip of copulatory seta, × 500.
,, 46.—*Octochaetus pachpaharensis*; spermatheca; *div.*, diverticulum (?).
,, 47.—The same; tip of penial seta, × *ca.* 300.
,, 48.—*Eutyphoeus turaensis*; spermatheca seen from above, as in dissection; the sac is attached to the body-wall by the middle of its under surface.
,, 49.—The same; penial seta; *a*, seen as a whole, × *ca.* 55; *b*, tip more highly magnified, × *ca.* 180.
,, 50.—*Eudichogaster ashworthi* (co-type); copulatory seta from spermathecal region.
,, 51.—The same; copulatory setae of neighbourhood of prostatic apertures (not however from segments xvii or xix); *a*, from Wahi near Mahableshwar; *b*, from Poona; *c*, from Saugor; *d*, from Jubbulpore.
,, 52.—*Eudichogaster trichochaetus*; penial setae; *a*, as a whole, × 37; *b*, the tip, more highly magnified, × 550.
,, 53.—The same; end of copulatory seta; × *ca.* 400.
,, 54.—*Eudichogaster prashadi*; *a*, region of male genital apertures; *b*, end of copulatory seta, × 500.
,, 55.—*Eudichogaster falcifer*; distal end of penial seta, × *ca.* 700.
,, 56.—*Eudichogaster pusillus*; spermatheca.
,, 57.—The same; tip of penial seta.
,, 58.—*Eudichogaster kinneari*; clitellum and male genital area (the seminal grooves are not seen; the grooves shown are irregular fissures in the floor of the H-shaped depression).
,, 59.—The same; spermatheca.

Fig. 41.

Fig. 42.

Fig. 43.

Fig. 44.

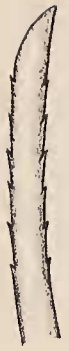

Fig. 45.

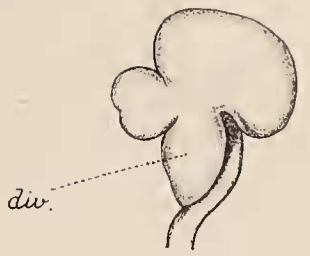

Fig. 46.

Fig. 47.

Fig. 48.

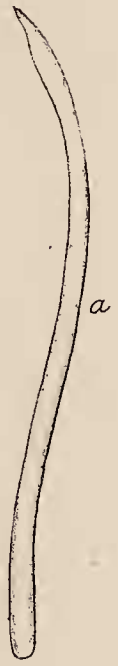

Fig. 49.

Fig. 50.

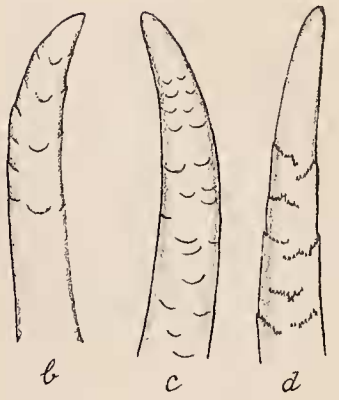

Fig. 51.

Fig. 52.

Fig 53.

Fig. 54.

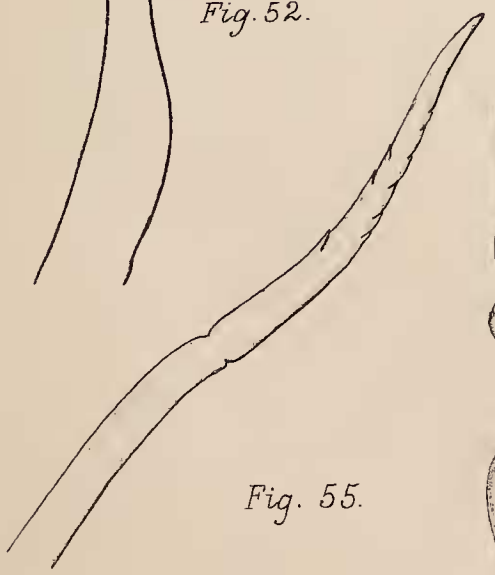

Fig. 55.

Fig. 56.

Fig. 57.

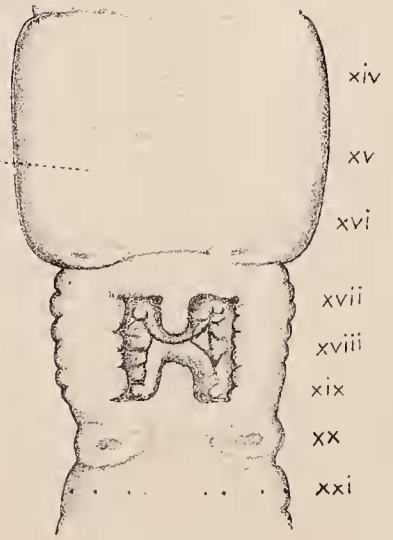

Fig. 58.

Fig. 59.

J. Stephenson del.

A. Chowdhary lith.

INDIAN & PERSIAN OLIGOCHAETA.